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Is lower socio-economic status associated with more impaired health care access and poorer quality of life in patients with COPD? What is the role of psychosocial factors in this relationship?

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Is lower socio-economic status associated with more impaired health care access and poorer quality of life in patients with COPD? What is the role of psychosocial factors in this relationship?

Sofia Georgopoulou

A Thesis submitted for the Degree of

Doctor of Philosophy

King's College London

School of Medicine

February 2014

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“The woods are lovely, dark and deep.

But I have promises to keep,

And miles to go before I sleep,

And miles to go before I sleep”

(Stopping By Woods On A Snowy Evening by Robert Frost)

Acknowledgements

This thesis would not have been realised without the continuous and invaluable support and guidance of my supervisors Dr. Patrick White, Dr. Alison J. Wright and Prof. John Weinman who have been great sources of inspiration and motivation throughout my studies. Their infinite kindness and help is deeply appreciated. I would like to express particular gratitude to Dr. Patrick White who not only provided me with the unique opportunity to do a PhD but also for his tireless encouragement, patience and refreshing enthusiasm during these 3 years which were full of challenges and unexpected events. You are an extraordinary teacher and a remarkable person. Having been taught and guided by you has been an honour, a pleasure and an amazing experience which I will treasure forever.

Special thanks to my mum and dad for their support and for believing in me and encouraging me when nobody else would.

A big thank you to all my fantastic colleagues from the 9th floor who have been such a great team and a vast source of support, kindness, motivation and encouragement. Sharing the good and bad times with you was a privilege.

I am also immensely grateful to all 207 patients who participated in this study. Not only did they offer their time so generously but they were lovely, extremely patient and helpful in realising this study despite the long duration of the interviews and the never-ending questions.

Abstract

Background: Socioeconomic deprivation is a determinant of health care access and quality of life in many diseases. The current study explored this effect in Chronic Obstructive Pulmonary Disease (COPD) and examined the role of psychosocial variables in this relationship.

Aims: The primary aim of this thesis was to establish whether lower socio-economic status (SES) was associated with decreased health care access (HCA) and poorer quality of life (QoL) in patients with COPD. The secondary aim examined whether psychosocial factors mediated the relationship between socio-economic status, health care access and quality of life.

Methods: Cross-sectional, interview-based survey in London involving COPD patients > 40 years recruited in primary care. Measures included socio-economic status, illness perceptions, health care access, quality of life, Medical Research Council (MRC) dyspnoea scale, general self-efficacy scale, social capital, Hospital Anxiety and Depression Scale (HADS), and spirometry.

Results: COPD confirmed by spirometry in 176 (85%) participants. 38.6% female, mean age 69 years, distribution of disease severity (GOLD): Grades 1-4 (mild – very severe) = 15%; 51%; 30%; 5%. Lower SES was not associated with more impaired HCA. Lower SES in terms of income level was associated with poorer QoL. The relationship between SES and HCA was not mediated by any of the psychosocial variables but the relationship between SES in terms of income level and QoL was.

Conclusion: More deprived COPD patients were as likely to get equal HCA as their more affluent counterparts. More deprived COPD patients in terms of income level were more likely to report poorer QoL. Illness perceptions were significantly associated with HCA and QoL. Findings emphasized the role of SES measures and illness perceptions in this patient group and the variability of their effect on different outcomes. Future research involving longitudinal design could increase understanding of these associations in different life and disease stages.

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Abbreviations

6-MW: 6-minute Walk Test

ADL: Activities of Daily Living

AECOPD: Acute Exacerbation of Chronic Obstructive Pulmonary Disease

ANCOVA: Analysis of Co-variance

ANOVA: Analysis of Variance

ATS: American Thoracic Society

BDI II: Beck Depression Inventory II

BMI: Body Mass Index

BODE: Body Mass Index, Airflow obstruction, Dyspnoea, Exercise capacity

BORG-CR10: Dyspnoea & Perceived Exertion Scale

BSI: Brief Symptom Inventory

CASP-19: Control, Autonomy, Self-realization and Pleasure questionnaire

CAT: COPD Assessment Test

CCI: Charlson Comorbidity Index

CFA: Confirmatory Factor Analysis

CI: Confidence Interval

CKD: Chronic Kidney Disease

CO_2: Carbon Dioxide

COPD: Chronic Obstructive Pulmonary Disease

COPDSS: Chronic Obstructive Pulmonary Disease Severity Score

CRQ-SAS: Chronic Respiratory Questionnaire (Standardised)

CRQ-SR: Chronic Respiratory Questionnaire (Standardised)

CSM: Common Sense Model

CSRI: Client Service Receipt Inventory

DAL: Daily Activities of Life

DF (df): Degrees of freedom

E&D: Emergency Department

ESRD: End-Stage Renal Disease

FEV1 (% pred.): Forced Expiratory Volume in 1 sec (percent predicted)

FVC: Forced Volume Capacity

GOLD: Global Initiative for Chronic Obstructive Lung Disease

GP: General Practitioner

GSE (Scale): Generalised Self-Efficacy (Scale)

HADS: Hospital Anxiety and Depression Scale

HBM: Health Belief Model

HCA: Health Care Access

HRQoL: Health-Related Quality of Life

IADL: Instrumental Activities of Daily Living

ICS: Inhaled Corticosteroids

IMD: Index of Multiple Deprivation

IP(s): Illness Perception(s)

IPQ-R: Illness Perceptions Questionnaire - Revised

KCH: King's College Hospital

LABA: (Inhaled) Long-acting beta-agonists

LAMA: (Inhaled) Long-acting antimuscarinic bronchodilators

LSOAs: Lower Layer Super Output Areas

MARS: Medication Adherence Response Scale

MCS: Mental Component Score

MMRC: Modified Medical Research Council Dyspnoea Scale

MOS-SF20: Medical Outcome Survey-SF20

MRC Dyspnoea Scale: Medical Research Council Dyspnoea Scale

NHP: Nottingham Health Profile

NHS: National Health Service

NICE: National Institute for Clinical Excellence

NSF: National Service Framework

OR: Odds Ratio

PASE: Physical Activity Scale for the Elderly

PBC: Perceived Behavioural Control

PCS: Physical Component Score

PDSS-SR: Panic Disorder Severity Scale Self-Report

PMT: Protection Motivation Theory

PR: Pulmonary Rehabilitation

QLQ-LC13: The European Organization for Research and Cancer Treatment Quality of Life Questionnaire supplement for lung cancer

QOF: Quality and Outcomes Framework

QoL: Quality of Life

QWB-SA: Self-administered Administered Quality of-Well-Being Scale

RA: Rheumatoid Arthritis

RCT: Randomised Control Trial

RR: Relative Risk

SABA: (Inhaled) Short-acting beta-agonists

SAMA: (Inhaled) Short-acting antimuscarinic bronchodilators (anticholinergic)

SC: Social Capital

SCT: Social Cognitive Theory

SD: Standard Deviation

SE: Standard Error

SES: Socio-economic Status

SET: Self-Efficacy Theory

SF-36 MOS: SF-36 Medical Outcome Survey

SGRQ: St. George's Respiratory Questionnaire

TPB: Theory of Planned Behaviour

TRA: Theory of Reasoned Action

TTM: Trans-Theoretical Model

UCL: Utrecht Coping List

UK: United Kingdom

USA/US: United States of America / United States

WHO: World Health Organisation

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Chapter 1

An introduction to Chronic Obstructive Pulmonary Disease (COPD)

1.1 What is COPD?

"Chronic Obstructive Pulmonary Disease (COPD), a common preventable and treatable disease, is characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lungs to noxious particles or gases (GOLD, 2011). Exacerbations and co-morbidities contribute to the overall disease severity in individual patients. COPD is an umbrella term that encompasses emphysema and chronic bronchitis. Chronic impairment in airflow is caused by a combination of damage to the parenchyma (emphysema) and small airways disease (obstructive bronchiolitis) which varies in different people. Emphysema and chronic bronchitis are the result of inflammatory processes. In emphysema, inflammation leads to the destruction of the lung parenchyma followed by a decrease in alveoli in the small airways and loss of elasticity. This prevents the airways from remaining open during expiration. During the inflammatory process in the lung tissues, a release of trypsin and other proteolytic enzymes leads to the destruction of lung tissue – mainly alveoli – with the loss of lung surface where gas is exchanged. As a result, there is great difficulty in getting oxygen in and smaller difficulty in getting CO_2 out. In chronic bronchitis, small airways become narrower and undergo changes such as thickening in their structure due to chronic inflammation. The inflammation leads to excess production of mucus, an inflammatory infiltrate by lymphocytes, thickening of the basement membrane and ultimately irreversible fibrosis. The narrowing of the airways, the inflammatory infiltrate and mucus production becomes irreversible. In the later stages of the disease, severe irreversible narrowing in combination with lung destruction might occur. Overall the patient has difficulty moving air in and out due to airway narrowing. When the air gets in, there may be only a small amount of surface area available for gas exchange to take place (GOLD, 2011).

The main symptoms of COPD include breathlessness, chronic cough and sputum production (GOLD, 2011). These can deteriorate on occasions and lead to exacerbations. An exacerbation is defined in GOLD (2011) as "an acute event

characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication" (Burge & Wedzicha, 2003; Celli & Barnes, 2007; Rodriguez-Roisin, 2000). Exacerbations contribute to lung function decrease, deterioration of health status and increase in mortality risk (GOLD, 2011).

1.2 Epidemiology, causes, and risk factors for COPD

COPD is a major cause of increasing morbidity and mortality worldwide (GOLD, 2011). It is estimated that by 2030, it will be the 3rd leading cause of death globally (Buist et al., 2007) and 5th in terms of disease burden (Antó, Vermeire, Vestbo, & Sunyer, 2001). 1.4 million people over the age of 15 are estimated to have COPD in the UK reaching a prevalence of 3.58% (Nacul et al., 2011). The mean prevalence of patients diagnosed with COPD recorded through the Quality and Outcomes framework (QOF) was 1.37% (Nacul et al., 2011). Most of the undiagnosed patients are likely to have relatively mild disease. The majority of patients with respiratory disease are treated by primary care physicians such as GPs (Bellamy et al., 2006). Based on QOF estimates, the average number of patients with COPD in an average UK GP practice list is approximately 107. COPD is responsible for 2% of hospitalisations per year making COPD the second largest cause of emergency admissions in the UK (Healthcare Commission, 2006). COPD places considerable financial and social burden on patients and health care systems with COPD-related expenditure for the NHS amounting to £800 million annually (Department of Health, 2005; Nacul, Soljak, & Meade, 2007).

Risk factors for COPD include age and gender. Prevalence is higher in people over 45 years of age (5.3%) compared to younger age groups (3.1%). In adults over 45 years, men are more likely to suffer from COPD (6.8%) compared to women (3.9%) (Nacul et al., 2007). Lower socio-economic status (SES) has been associated with higher COPD morbidity and mortality rates (Gershon, Dolmage, Stephenson, & Jackson, 2012). More deprived patient groups present with greater severity of COPD, more impaired lung function, worse physical functioning and higher risk of exacerbations (Eisner et al., 2009).

COPD involves changes in pulmonary pathophysiology that affect the central and peripheral airways, lung parenchyma and pulmonary vasculature (Saetta, 1999; Rennard, 1999; Peinado et al., 1999). An inflammatory response in the lungs can be

triggered by tobacco smoke or other noxious particles and gases. The changes produced by these pathogenic mechanisms lead to a number of physiological abnormalities that result in chronic thickening of the airways and destruction of the lung parenchyma (Snider, 1989; O'Donnell, 2001).

The main cause of COPD is smoking. According to the World Health Organization, 73% of COPD-related mortality in high-income countries is caused by smoking. Other risk factors for COPD include exposure to outdoor, occupational and indoor air pollution such as biomass fuels, heating, asbestos, fumes and vapours (GOLD, 2011). A further but less common cause of COPD involves a genetic vulnerability called alpha-1 antitrypsin deficiency. Alpha-1 antitrypsin deficiency is an inherited condition in which symptoms of COPD manifest earlier than the usual age of onset (i.e. < 45 years) (GOLD, 2011).

1.3 Diagnosis and assessment of COPD

According to GOLD guidelines (2011), "a diagnosis of COPD should be considered in any patient who has dyspnoea, chronic cough and sputum production, and/or a history of exposure to risk factors for the disease. In order to diagnose COPD, spirometry is required. COPD is confirmed with a post-bronchodilator $FEV_1/FVC<70\%$. The rate of misdiagnosis of COPD is high because often diagnosis is made based on symptoms alone and is not confirmed by spirometry (Jones et al., 2008).

Severity of COPD is assessed taking into account patient symptoms, the degree of airflow limitation, risk of exacerbation and co-morbidities (GOLD, 2011). Instruments used for assessment of severity include questionnaires such as the COPD Assessment Test (CAT) or the Medical Research Council (MRC) dyspnoea scale. Four GOLD grades are used to characterise COPD severity (see Table 1.1). Risk of exacerbation is defined as the likelihood of "an acute event characterised by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication" (GOLD, 2011). Previous exacerbations and increasing airflow limitation raise the risk of frequent future exacerbations. Co-morbidities are assessed because they could influence mortality and hospital admission rates. Co-morbidities in COPD patients often include cardiovascular diseases, depression, anxiety, lung cancer, skeletal muscle dysfunction and metabolic syndrome (GOLD, 2011).

Table 1.1 GOLD classification of COPD severity

Grade 1 (mild)	FEV1 ≥ 80% predicted
Grade 2 (moderate)	50% ≤ FEV1 < 80% predicted
Grade 3 (severe)	30% ≤ FEV1 < 50% predicted
Grade 4 (very severe)	FEV1 < 30% predicted or FEV1 < 50% predicted plus chronic respiratory failure

1.4 Management of COPD

Changes in lifestyle and workplace and pharmacologic therapy are sometimes imperative for patients with COPD. The most important change is to stop smoking because it can prevent progression of COPD. There is a range of options available for patients with COPD to help them cope with their condition more effectively such as smoking cessation, reduction of exposure to pollution, uptake of exercise and adopting a balanced diet.

Pharmacologic treatment aims to reduce symptoms, exacerbation frequency and to improve quality of life. The main medication used for symptom management in COPD includes short- and long-acting inhaled bronchodilators such as beta2-agonists, anticholinergics, theophylline, or combination therapy depending on symptom response and medication tolerance (GOLD, 2011). Long-acting inhaled bronchodilators decrease the risk of exacerbations, hospital admissions and improve quality of life (GOLD, 2011). Combination therapy such as inhaled corticosteroids with a long-acting beta2-agonist can reduce the risk of exacerbation compared to individual inhaled medication. Combination therapy is recommended for severe and very severe COPD. Antibiotics are also prescribed for exacerbations (GOLD, 2011).

There are other treatment approaches available to patients with COPD such as pulmonary rehabilitation, oxygen therapy, ventilator support and surgery. Pulmonary rehabilitation (PR) is a programme that involves exercise training and patient education. It relieves dyspnoea and fatigue, increases patients' control over their COPD and improves emotional function (Lacasse, Martin, Lasserson, & Goldstein, 2007). Oxygen therapy, ventilator support and surgery are recommended for patients with more severe COPD but their impact on increasing survival rates varies and effects

on quality of life are not significant. Oxygen therapy improves survival rates in people suffering from hypoxia but not in people who do not while ventilator support or surgery do not have any effect on survival.

1.5 Summary

Chronic obstructive pulmonary disease is a progressive respiratory condition that manifests with a variety of symptoms and significantly influences patients' quality of life. A variety of treatment approaches are available to patients. They aim to prevent disease progression, provide relief from their symptoms and improve quality of life. Lower socio-economic status has been associated with higher morbidity and mortality rates, poorer quality of life and increased risk for exacerbations in patients with COPD. What needs to be taken into consideration is that COPD is a progressive disease that is not significantly improved by drugs and other treatments. Exploration of psychosocial influences such as SES, illness perceptions, self-efficacy and social capital might enhance our understanding of the ways in which patients experience and manage COPD. Findings could increase the likelihood of our ability to influence this disease which affects mainly people who are already among the most vulnerable in our society.

Chapter 2

Literature review I: The role of socio-economic status in health, chronic illness and COPD

2.1 Socio-economic status (SES) and health

a. Historical origin

The primary aim of this thesis was to examine whether lower SES was associated with more impaired HCA and poorer QoL in COPD. This chapter discusses the origins and evidence for this link as well as the challenges arising and the explanations proposed.

The relationship between poverty and poor health has been debated since the 19th century. In the United Kingdom, it was the mid-19th century when interest in the role of socio-economic conditions to investigate population health emerged. Details on occupational status were first collected during the 1841 Census (Woollard, 1999). Based on the data gathered from the census, all people – except for housewives, children and the unemployed – were originally grouped into crude occupational classes. This classification was later refined by William Farr in 1851 who examined mortality rates between people within the same and different occupations and found significant differences (Annual Reports of the Registrar General in England 1875, 1885; cited in Farr, 2000). The classification of occupations triggered further investigation into sanitary conditions, mortality rates, children's and adults' height and weight and led to comparisons between people who lived below poverty boundaries and people of higher social classes (Rowntree, 1901; Stevenson, 1911; cited in Freeman, 2011). This set the ground for deeper examination of social inequalities in health and associated possible causes.

b. Contemporary debate

Associations between socio-economic factors and health behaviours, healthcare access and health outcomes exist and persist into very old age (Brunner, Marmot, Marmot, & Wilkinson, 1999; Whitehead, Townsend, & Davidsen, 1992). Health

determinants arise from a variety of sources and interact in several ways influencing people's well-being, health and quality of life (Marmot, et al., 2010). People with lower socio-economic status (SES) generally display higher morbidity and mortality rates than people from a higher socio-economic background (Adler & Rehkopf, 2008; Mackenbach, et al., 1997; Mielck, et al., 2000; Saydah & Lochner, 2010; Brunner et al., 1999). The lower the SES level the higher the prevalence of chronic diseases especially angina, heart disease and arthritis (Callahan, 2003; Lee & Carrington, 2007; Liu, Ma, Yin, Kelepouris, & Eisen, 2011).

SES is a multi-dimensional concept commonly described by income level, educational level and occupational status which are associated with certain outcomes in different ways. For example, lower income level was linked to poorer health and well-being through area deprivation, smoking, psychosocial stress, unhealthy eating patterns and limited exercise (Winkleby, Sundquist, & Cubbin, 2007; Prescott and Vestbo, 1999; Winkleby et al., 2007). Further pathways included quality of healthcare provision (Herndon, Kornblith, Holland, & Paskett, 2011), physician performance in chronic illness management, preventive care, diagnosis and treatment (Bernheim, Ross, Krumholz, & Bradley, 2008; Clegg, et al., 2009; Ford & Jones, 1991; Franks & Fiscella, 2002). In contrast, higher educational attainment was associated with better illness self-management and treatment adherence in patients with diabetes and HIV and higher survival rates in breast cancer (Goldman & Smith, 2002; Herndon, et al., 2011).

There is conflicting evidence for the varying importance of the three SES measures commonly used – income, education and occupation. For example, an association between occupation – but not for income and education – and gastric cancer survival was reported (Kuwahara, et al., 2010). These inconsistent results were attributed to various factors such as stage of diagnosis, treatment access and nature and biology of the tumours (Woods, Rachet, & Coleman, 2006). Thomson, Hole, Twelves, Brewster, & Black (2001) found that differences in outcomes for women with breast cancer such as survival rates could not be explained solely by variation in SES since they were larger than expected. Differences in treatment factors were also observed between more affluent and less affluent women but they still could not account for the differences in survival. The authors suggested that other factors might have been mediating the effect of SES such as co-morbidities or nutritional patterns. Wrigley et al. (2003) found that lower SES was associated with decreased survival in colorectal cancer. This association was statistically significant only when death from all causes and not specifically from colorectal cancer was used as an outcome. However, the study was

conducted in an affluent area with only approximately 30% of the participants living in a more deprived area than the national average. This could have biased results due to insufficient power to detect the effect exerted by deprivation. Despite the limitations of the studies, these results suggested that there might be additional factors implicated in the relationship between lower SES and poorer health.

The aforementioned studies supported the existence of a social gradient in health. This gradient refers to the relationship between population health inequalities and social status inequalities. Higher socio-economic position is associated with better health. Social inequalities in health still remain a matter of concern in contemporary societies. The broad and pervasive effect exerted by socio-economic status on health was demonstrated by the findings of the Whitehall study (Marmot et al., 1991). The Whitehall study examined morbidity and mortality rates in British civil servants in different occupation grades over a period of 10 years. There was a significant difference between the lowest and the highest occupation grade in coronary heart disease mortality in addition to income level (Marmot et al., 1991). Further evidence that income is not the sole factor in health disparities came from the Black Report which emphasised that despite free health care provision through the National Health Service, health disparities in mortality rates by social class continued to increase (Black, Morris, Smith, & Townsend, 1980). Social ranking and dominance were proposed to explain these relationships. The considerable impact of stress on physiological functioning due to social ranking and dominance was also observed in primates (Sapolsky, 2005). Depending on their social ranking, psychological and physical stress were associated with most severe stress-related medical conditions. However, the nature of the mechanism that underlies the relationship between socio-economic status indicators and health still remains elusive to a significant degree and whether this hypothesis can be extended to humans and to what degree is not clear (Subramanian, Belli, & Kawachi, 2002; Adler & Ostrove, 1999).

The hypothesis that social ranking might be implicated in the association between socio-economic status and health makes the assumption that absolute income is not sufficient to explain health inequalities more likely. Lack of financial resources alone cannot explain differences in population health. Further factors relating to the immediate and wider social environment as well as psychological functioning need to be considered such as relative deprivation (Wilkinson, 1997). The relative deprivation hypothesis, was defined as "the conscious experience of a negative discrepancy between legitimate expectations and present actualities" (Schaffner & Torgler, 2008).

An increase in relative deprivation was associated with higher likelihood of self-reported poor health even when socio-economic and demographic variables were controlled for (Subramanyam, Kawachi, Berkman, & Subramanian, 2009). Lower-rank employees within the same reference group experienced worse health based on self-report. The authors emphasized the difficulty in defining a reference group in the same way in which people try to compare themselves with individuals from higher SES levels (Subramanyam et al., 2009).

Pham-Kanter (2009) found that health status was associated only with extremes of relative deprivation and physiological stress. Position at the lowest end of SES was linked to poorer self-rated health, higher burden of disease and increased incidence of cardiovascular disease. In contrast, individuals at the highest end of social position were less likely to report diabetes, ulcers or hypertension problems. The author emphasized that the psychosocial stress mechanism affecting health could only partially explain differences in health status suggesting that there may be other variables that could help explain health disparities.

Health inequalities can influence health care access and survival in lower SES groups through financial or social pathways. For example, socio-economic factors had a modest effect on stage diagnosis for cancer but a significant effect on survival in Canada where universal health insurance provides free health care for the whole population (Booth, Li, Zhang-Salomons, & Mackillop, 2010). The breast cancer survival gradient could be explained only partially by cancer stage when diagnosis was made. This inconsistency was attributed to the facilitation to health care access due to universal health insurance. The same could be true for the United Kingdom where health care provision is not determined by insurance status (Thomson et al., 2001; Wrigley et al., 2003).

- Conclusion

There is significant evidence for the association between lower socio-economic status and poorer health status as well as increased morbidity and mortality rates. However, lower SES cannot solely explain worse health because despite the availability of equal health care access, morbidity and mortality rates were not improved in lower SES groups. This suggested that factors other than HCA such as household income, personality characteristics or illness beliefs might contribute to poorer outcomes. These

factors could have an influence on health status by mediating the relationship between lower SES and poorer health. What appears to be the case is that socio-economic factors alone are not sufficient to explain poorer health. This suggests that identification of additional variables such as illness beliefs or personality characteristics could increase our understanding of the mechanisms underlying this relationship.

2.1.1 Pathways of SES influence on Health

There are different pathways through which lower SES could be linked to poorer health such as material resources and psychosocial factors (Lynch & Kaplan, 2000; Wilkinson, 1999). The distinction between material and cultural circumstances proposed by the Black Report was not well-defined since material resources can significantly influence both culture and behaviour. Sally Macintyre & Ellaway (2003) suggested that there are other factors beyond the individual that should be taken into consideration to explain disease occurrence and health status such as socio-economic circumstances of the population. These suggestions are not mutually exclusive but may interact or complement each other.

Inequality in access to health care has been examined in an attempt to explain the relationship between SES and health. While lack of universal health care coverage was reported to increase health disparities by limiting access to health care services (Lasser, Himmelstein, & Woolhandler, 2006) the evidence appears to vary depending on the outcomes examined. For instance, although general practitioner visits and hospital services utilization were more frequent in lower SES groups, specialist referrals were more frequent in higher SES groups (Veugelers & Yip, 2003). Specialist services in the last three years of life were considerably higher in the more affluent group. These findings suggest that increased utilisation of GP and hospital services by lower SES groups would attenuate the effect of SES on mortality but the increase in specialist care provided to higher SES groups would increase the socioeconomic inequalities in health. Lack of power in this study prevented strong conclusions regarding difference in mortality based on income and its impact on health services.

Could universal health coverage eliminate health disparities? Additional factors implicated in health care access complicate this issue. For example, accessing free-at-point-of-use health care services involves additional costs relating to practical issues such as transportation availability and expenses. Research suggested that impaired or

unavailable health care access as well as poor quality of medical treatment only account for approximately 10% of premature mortality worldwide (McGinnis et al., 2002).

Differences in health status and disease rates both between and within countries have partly been attributed to socio-economic structures and factors such as poor health, living environment, work status, social exclusion, availability of social networks and relationships, lifestyle (Hemingway & Marmot, 1999; Marmot, 1999) in childhood and adulthood (Galobardes, Lynch, & Smith, 2004; Galobardes, Lynch, & Smith, 2008; Davey Smith & Lynch, 2004). Adult health status and physical function can be predicted even half a century later by adverse childhood socio-economic conditions such as poor nutrition, health problems and family background (Huang, Soldo, & Elo, 2011; Guralnik, Butterworth, Wadsworth, & Kuh, 2006).

The evidence appears to support the relationship between lower SES and poorer health through a number of different pathways leading to social inequalities in health: (a) unhealthy lifestyles which are more prevalent in lower socio-economic levels (Lantz et al., 2001; Lynch et al., 1997); (b) unequal provision of healthcare quality and access to health services (Feinstein, 1993; Mackenbach, Stronks, & Kunst, 1989); and (c) material deprivation and exposure to stressful psychosocial environments from as early as in-utero through to childhood and later adulthood life (Kuh & Ben Shlomo, 1997; Marmot & Wilkinson, 2001).

2.1.2 “Social causation” or “social selection?”

Socio-economic status can affect health, a phenomenon termed “social causation” (Marmot, Shipley, & Rose, 1984; Marmot et al., 1991; van Rossum, Shipley, van de Mheen, Grobbee, & Marmot, 2000). Health can also influence socio-economic status termed “social selection” (The Black Report, DHSS; Black, et al., 1980). “Social selection” refers to people with better health having the opportunity to ascend the socio-economic ladder while those with poorer health – disadvantaged in terms of occupation and income – are more likely to descend it (Blane, Smith, & Bartley, 1993; Bartley & Plewis, 1997). Different occupations and associated activities place varying demands on people. Poorer health could influence people’s career choices and could, for example, steer them to a higher academic level which would place fewer demands on the physical component compared to a more physically demanding job (Ostlin,

1988). This kind of “social selection” follows a direct pathway. Poorer health leads to lower socio-economic status in society. There is also an indirect pathway (Sally Macintyre & West, 1991; West, 1988; West, Macintyre, Annandale, & Hunt, 1990; Wilkinson, 1986). This involves factors other than health that can influence mobility on the social ladder such as education, childhood deprivation and height which are used to predict adult SES and health. These factors can have an effect on either health or SES or both. Evidence for “social causation” is stronger than for “social selection” based on findings showing associations between lower SES and major depression, substance abuse and antisocial personality (Dohrenwend, Levav, Shrout, & Schwartz, 1992). Social factors unrelated to health such as unemployment or adverse life events can also lead to lower SES (Hamilton, Broman, Hoffman, & Renner, 1990; Shrout, et al., 1989).

2.1.3 Does the SES gradient exist for all diseases?

The SES gradient exists in various diseases such as arthritis, cardiovascular disease, tuberculosis, chronic respiratory and gastrointestinal diseases (Matthews, Kelsey, Meilahn, Muller, & Wing, 1989), mild cognitive impairment and dementia (Cantwell, McKenna, McCray, & Onorato, 1998; Cunningham & Kelsey, 1984; Goldbourt, Schnaider-Beeri, & Davidson, 2007; Kaplan & Keil, 1993; Marengoni, Fratiglioni, Bandinelli, & Ferrucci, 2011; Matthews, et al., 1989). In general, cancer incidence is more likely to be linked to lower SES (Dalton, et al., 2008) particularly co-morbidity in cancer (Louwman, et al., 2010). The effect of SES varies depending on the type of cancer and whether incidence or survival is examined. For instance, incidence of breast and prostate cancer and malignant melanoma is more common in higher SES groups while cervical, lung and colorectal cancer in lower SES populations (Devesa & Diamond, 1980; Hakama, Hakulinen, Pukkala, Saxen, & Teppo, 1982; Yin, et al., 2010). Survival rates are also increasing with higher SES in colon and breast cancer (Carnon, et al., 1994; Dayal, Power, & Chiu, 1982; McBride, Lebwohl, Hershman, & Neugut, 2010; McBride et al., 2010).

2.1.4 The existence of the SES gradient in different populations

Most developed countries also exhibit a gradient in SES (Adler & Ostrove, 1999). This gradient appears to be weaker in more privileged countries such as in Scandinavia (Feinstein et al., 1993) but can vary according to time. An increase in mortality rates after a period of recession were not observed in Finland (Valkonen, et al., 2000). Therefore, the authors suggested that a delayed effect of the impact of the recession on health might only be evident in later years.

SES is a multidimensional and complex concept which includes a wide range of variables relating to financial, occupational, and educational domains (Duncan, 1961; Green, 1970; Mueller & Parcel, 1981). Despite the interrelationship among these dimensions of SES, each of them reflects relatively different individual and societal forces associated with health and illness. Educational attainment, occupational class, and income level represent overlapping resources in terms of general social status to a degree. For instance, more educated people might acquire knowledge of health-improving behaviour easier than less educated people. Indirect pathways between education and well-being have to be considered such as better jobs which can secure higher income (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006; Lahelma, Martikainen, Laaksonen, & Aittomäki, 2004; Martikainen, Blomgren, & Valkonen, 2007; Mirowsky, Ross, & Reynolds, 2000). Certain dimensions of SES are more predictive of health than others in different ways (Fuchs, 1979; Kitagawa & Hauser, 1973; Williams, 1990). For instance, income level reflects spending power, housing conditions, dietary patterns, and medical care; occupational class reflects prestige, responsibility, physical activity, and work exposure; education indicates skills required for the acquisition of positive social, psychological, and economic resources (Antonovsky, 1967; Susser & Watson, 1962).

Differences in the pathways of SES influence on health also exist between countries (Banks, Marmot, Oldfield, & Smith, 2009) involving neighbourhood SES, social exclusion and ethnicity (Clarke, Farmer, & Miller, 2010; Nayar, 2007; Yin et al., 2010). For example, the equivalent of the Whitehall study was conducted in Nigeria and findings were contradictory to the ones in the British study. Officials in higher grades had greater likelihood of cardiovascular disease based on the risk factor incidence, for example, obesity, high blood pressure and unhealthy diet (Bunker, Gomby, & Kehrer, 1989). Bunker et al. (1989) concluded that higher socio-economic status rather than occupational factors was associated with increased prevalence of hypertension among the male higher ranking staff. However, job demands and stress could not be measured reliably and could have differed between employees and countries. Other

studies did not find evidence for differences in blood pressure according to occupation in lower to middle SES groups (Idahosa, 1987; Oviasu & Okupa, 1980; Simmons, Koblinsky, & Phillips, 1986). However, these studies only measured one aspect of health status – blood pressure – and they were all conducted in Africa. The differences observed could be due to the Western lifestyle and work conditions and demands which differ from those existing in Africa.

Similar findings were reported for the Western world regarding lower SES and poorer health. When the SES gradient was compared between the USA and the UK, differences were found for various diseases (Banks et al., 2009). Higher incidence of diabetes was found in higher SES groups in the USA but the reverse was true for the UK. In contrast, the SES gradient was similar for stroke, heart attacks and lung disease with lower SES increasing the risk of their incidence. No particular SES gradient was detected in cancer occurrence in either country, but this was thought to be due to various other factors (Banks et al., 2009).

The SES gradient can vary within the same country, for example, in terms of ethnicity and neighbourhood SES (Clarke et al., 2010). Life expectancy followed a gradient in SES among Whites and African-Americans in a study in California but not in Hispanics and Asians. This was partly attributed to neighbourhood SES. These variations in SES suggest caution when making conclusions regarding its influence on health status. The different SES indicators and their relationship with certain health outcomes as well as people's individual and social circumstances have to be taken into consideration when exploring the role of SES in health. The aforementioned findings highlight the complexity of SES and the weaknesses and strengths of each SES dimension. Some SES measures reflect more individual-based aspects of deprivation while some measure more area-level-based elements. They can complement each other and – if used in combination – may contribute to a more comprehensive assessment and global reflection of the pathways that could be operating in the relationship between SES and health. In addition, particular characteristics of the country and the population in question need to be considered when interpreting findings.

2.1.5 The effect of SES according to its indicators (income, education, occupation)

The most common SES markers in research involve income, education and occupation. One or two markers may be more strongly associated between them compared to a third one (Rosengren, et al., 2009; Marengoni et al., 2011; Banks et al., 2009) especially when investigated at the societal level such as neighbourhood SES (Clarke et al., 2010). Additional markers of SES such as neighbourhood deprivation were associated with increased risk of premature mortality, chronic diseases and their risk factors irrespective of income, education and occupation (Bosma & Kunnen, 2001; Pickett & Pearl, 2001) although in some the associations were moderate (Major, et al., 2010; Veugelers, Yip, & Kephart, 2001).

- Conclusion

Lower income and educational level as well as lower occupation class appear to be associated with a poorer effect on health but they are not the only factors to influence well-being. They are not sufficient on their own to provide a satisfactory explanation of health inequalities. Psychosocial and environmental exposures, biological, behavioural and personal characteristics of the different populations have to be considered in order to fully understand and explain the differences in health status, some of which will be discussed in the following sections.

2.2 Socio-economic status and COPD

2.2.1 COPD prevalence and mortality

Socio-economic deprivation is linked to increased COPD prevalence and mortality (Prescott and Vestbo, 1999; Yohannes and Connolly, 2001; Yohannes et al., 1998; Shohaimi et al., 2004). Higher prevalence of COPD is associated with more deprived backgrounds in terms of social and occupational class, higher area deprivation, relative poverty, lower education and income levels, social isolation and limited social support, sedentary lifestyle and loneliness (Prescott and Vestbo, 1999; Yohannes et al., 1998; Yohannes and Connolly, 2001; Shohaimi et al., 2004). Some studies have failed to find support for significant effects of higher deprivation in terms of social class, heating or crowding in the home which could influence the emergence of COPD (Farr, Bartlett, Wadsworth, & Miller, 2000).

COPD prevalence and mortality have been associated with low socio-economic status partly due to its relationship with smoking (Doll et al., 1994; Peto et al., 1996). Tobacco smoking has been reported as the main cause of the development of COPD, especially in high and middle-income countries. 73% of COPD deaths in high-income countries is attributed to smoking whereas in low- to middle-income countries death rates drop to 40% (Mannino & Buist, 2007). This difference could be due to additional factors such as indoor air pollution involving biomass fuels used for heating and cooking, outdoor pollution and occupational exposure to fumes and vapours ((WHO, 2010; Mannino & Buist, 2007; Pandey, 1984; Pérez-Padilla et al., 1996; Behera & Jindal, 1991; Buist et al., 2007). Reasons for higher rates in COPD deaths due to smoking include longer history of smoking in industrialized countries, and incomplete mortality and smoking data for developing countries (Ezzati & Lopez, 2004).

Poverty confers a greater risk of developing COPD and results in more complications in poorer people in comparison to wealthier groups (Anto et al., 2001; Shohaimi et al., 2004). However, poverty is used as an umbrella term to include various factors that can increase the risk of COPD such as poor diet due to financial hardship, high smoking rates, poor housing standards, exposure to fumes and gases, impaired access to health care services and childhood respiratory infections (Anto et al., 2001; Shohaimi et al., 2004). A detailed discussion of some of the risk factors that contribute to the incidence of COPD is provided below.

2.2.2 Pre-natal exposure and childhood infections

Fetal intra-uterine growth retardation in childhood is linked to adult respiratory function and status (Barker, et al., 1991; Shaheen & Barker, 1994; Shaheen, et al., 1994; Stein, et al., 1997). In-utero exposure to tobacco smoke due to maternal smoking (Young et al., 2000; Hanrahan et al., 1992) influenced lung function to a significant degree causing greater long-term damage to lung development and function than tobacco exposure after birth (Stein, et al., 1999; Tager, et al., 1993; Young et al., 2000). Lung function and wheezing after birth and through childhood (Martinez, Morgan, Wright, Holberg, & Taussig, 1988; Murray, et al., 2002; Young et al., 2000; Tager et al., 1993) and adolescence were associated with wheezing and asthma occurrence in later years (Håland, et al., 2006; Turner, Tutt, & Ashworth, 2004) ultimately increasing the risk of developing COPD in adult years (Barnes & Celli, 2009).

Whether a direct link between tobacco exposure in childhood and COPD exists is not clear. A relationship between lifetime exposure to tobacco smoke – as established by self-report – and COPD was observed (Yin, et al., 2007). This association disappeared when childhood and adult exposure were examined separately in a cross-sectional analysis of a prospective cohort study (Yin et al., 2007). Results showed an association between older adults who had been exposed to passive smoking at the workplace and at home and higher prevalence of COPD compared to non-exposed adults. However, a non-representative sample, different smoking rates, self-report and the cross-sectional design of the study could have influenced results. Tobacco exposure during childhood was linked to the development of COPD in later life in a case-control study (Johannessen, Bakke, Hardie, & Eagan, 2012). This relationship was stronger for childhood tobacco exposure than exposure in adulthood. The authors' findings differed from those of a study conducted in China that did not find a relationship between childhood passive tobacco exposure and risk of COPD. Johannessen et al. (2012) suggested that this could have been due to more equally distributed smoking rates among males and females in Norway whereas in China the majority of smokers were men (67%) with significantly lower percentage of women smoking (4%). This would mean that children would be equally exposed to tobacco smoking whether they spent time with their mother or their father. Possible bias in recalling past smoking exposure should also be taken into account when interpreting Johannessen et al.'s (2012) findings.

Decreased lung function in childhood and adult life was related to more frequent early childhood respiratory infections (Burrows, Knudson, & Lebowitz, 1977) mainly due to lung damage caused by a viral agent (Samet, Tager, & Speizer, 1983). Early childhood respiratory infections were also associated with more impaired lung function later in life (Martinez et al., 1988; Young et al., 2000; Tager et al., 1993) Early childhood respiratory infections as well as a history of asthma in the family were significant determinants of COPD risk (de Marco, et al., 2011). A small sample size due to COPD being relatively uncommon in younger age and possible misclassification of COPD due to lack of post-bronchodilator measurement might have affected results.

2.2.3 Housing conditions

Poor housing conditions have been implicated in increasing the risk of respiratory symptoms and COPD through overcrowding, dampness, use of biomass fuels and other mediators mentioned in detail below.

Exposure to harmful particles not only in the household but also at the workplace and the environment were associated with increased risk of developing COPD (Gothi, Shah, & Joshi, 2007; Weinmann, et al., 2008). Use of gas stove and solid fuels for cooking and heating (Torres-Duque, Maldonado, Pérez-Padilla, Ezzati, & Viegi, 2008; Viegi, Scognamiglio, Baldacci, Pistelli, & Carrozzi, 2001) and residential exposure to radon gas (Turner, et al., 2011) as well as air pollution and biomass fuel (Liu, et al., 2007; Orozco-Levi, et al., 2006; Zhang & Smith, 2007) have all been linked to increased respiratory symptoms, impaired lung function, higher mortality and lower socioeconomic status and confer higher risk of developing COPD.

Biomass smoke was an independent risk factor for COPD especially in early-life and long-term exposure (Chan-Yeung, Ait-Khaled, White, Ip, & Tan, 2004; Kurmi, Semple, Simkhada, Smith, & Ayres, 2010; Perez-Padilla, Schilmann, & Riojas-Rodriguez, 2010). Biomass smoke has been consistently reported to confer higher risk for the emergence of COPD, acute respiratory infections as well as wheezing episodes (Ekici, et al., 2005; Po, FitzGerald, & Carlsten, 2011). In addition, wood smoke increased the risk of COPD especially among current smokers, non-Hispanic whites, and men in comparison to former smokers, Hispanics, and women in a cohort study of smokers conducted in the United States. Wood smoke exposure was also strongly associated with decreased FEV_1, increased incidence of airflow obstruction as well as chronic bronchitis (Sood, et al., 2010). These effects remained even when controlling for age, smoking, and educational level.

Household crowding has also been linked to higher rates of respiratory infections and disorders (Britten, Davies, & Colley, 1987; Coggon, Barker, Inskip, & Wield, 1993) Coggon et al., 1993) especially domestic crowding at the age of two (Britten et al., 1987). Sub-standard housing conditions have been associated with increased COPD incidence for decades, as well as humidity (Brunekreef, et al., 1989; Burr, St Leger, & Yarnell, 1981) and dust mites (Soliman & Rosenstreich, 1986). Not all of these studies had adjusted for smoking in their analyses. The effect of smoking on the outcomes examined needs to be considered when interpreting findings.

People who perceived their home as being cold reported increased respiratory symptoms but not specifically for COPD (Gemmell, 2001). Rudge & Gilchrist (2005)

found that areas with a high Fuel Poverty Risk (homes with low energy efficiency levels with more than 10% of the household income spent on maintaining ideal temperatures indoors) showed significantly increased emergency respiratory admissions rates in the winter months from 1993 to 1997. However, the study did not specifically focus on COPD but included all respiratory diseases and did not control for any confounding variables. The authors did not find associations between deprivation and increased winter mortality rates. This finding suggested that it was probably not general poverty that was related to poor health status in winter but the combination of hard-to-heat buildings and decreased ability to afford heating. Lack of associations between socio-economic conditions and excess winter mortality could have been due to the use of measures of deprivation which do not include an indicator specifically assessing hard-to-treat housing such as the Townsend score.

2.2.4 Smoking

Smoking is main cause of COPD. There has been a worldwide increase of smoking rates in developing countries and a decrease in developed countries such as in the USA (Pierce, Messer, White, Cowling, & Thomas, 2011) as well as in the United Kingdom (Simpson, Hippisley-Cox, & Sheikh, 2010). In the UK, Simpson et al. (2010) found a significant decrease in smoking rates between 2001 and 2007. This could have been due to enhanced provision of smoking cessation services and specialist referrals. However, this decrease could merely have been a continuation of the secular trend that had started from 1972 and reached a plateau in 1997 (Office for National Statistics, 2000; Bridgwood Ann, 1998) The authors stressed that smoking rates remained increased in people from areas which displayed high socio-economic deprivation as well as young adults. The estimated number of smokers in the United Kingdom in 2007 was 13.7 million (Simpson et al., 2010) highlighting the fact that more research is required into the reasons why these people smoke and additional or more targeted interventions needed to aid them in stopping smoking.

A review by Hiscock, Bauld, Amos, Fidler, & Munafò (2012) found that prevalence of smoking is greater in low SES groups and these groups may be more vulnerable to the harmful effects of tobacco. Hiscock et al. (2012) suggested that smoking rates were higher in more deprived populations and the likelihood of success in quitting smoking was lower in these groups. Limited support and low motivation in quitting smoking,

stronger addictions and differences in psychological characteristics such as low self-efficacy were considered as factors influencing smoking cessation. For example, Businelle, et al. (2010) found that the association between SES and smoking was mediated by neighbourhood deprivation, social support, low mood or stress, and self-efficacy. These effects were true across three ethnic groups. Similarly, Pisinger et al. (2010) observed that the more likely reasons for low SES smokers to quit smoking included the cost of tobacco or health problems. Smokers from more deprived backgrounds were more likely to report that smoking cessation attempts had been a negative experience for them and that their relapse was due to nervousness, restlessness or depression. These findings highlight the need for smoking cessation programmes to be tailored to specific population needs such as lower SES groups. The reasons for starting, quitting and relapsing differ significantly between lower and higher SES groups. Therefore, different strategies need to be incorporated into interventions aimed at preventing initiation of smoking and aiding smokers in quitting or preventing relapse.

Forey, Thornton, & Lee (2011) suggested a causal relationship between smoking and COPD based on the fact that estimates did not change when adjusting for confounding variables and followed a dose-response relationship. This relationship was reflected in the increasing risk of COPD with long-term and heavy smoking, early starting age of smoking and prolonged smoking cessation, decreasing risk of COPD with increasing starting age and increasing quitting duration.

COPD affected between 25-45% of COPD patients who had never smoked depending on the country examined (Fukuchi, et al., 2004; Menezes, et al., 2005; Salvi & Barnes, 2009). It was suggested that smoking could increase risk of developing COPD later in life but COPD could also develop and progress in people who had never smoked before with a prevalence rate of 5.2% (Zhou, et al., 2009). Alternative factors such as social ranking, manual labour, educational attainment, environmental exposure to tobacco and biomass smoke, genetic factors, family history, childhood infections and poor home ventilation have been proposed as the causes of COPD in these patients (Hnizdo, Sullivan, Bang, & Wagner, 2002; Trupin, et al., 2003; Zhou et al., 2009). Passive exposure to tobacco smoke increased the likelihood of COPD developing in non-smokers (Eisner, et al., 2005) possibly through the additive effects on already existing burden of the lungs by inhaled particles and gases (Dayal, Khuder, Sharrar, & Trieff, 1994).

2.2.5 Occupational exposure – social class (education, income, occupation)

Increased risk of COPD has been associated with exposure to toxic fumes in the workplace (Chester, Gillespie, & Krause, 1969), grain residue in farms (Husman, Koskenvuo, Kaprio, Terho, & Vohlonen, 1987) and dust particles and fumes in factories (Becklake, 1989). Balmes (2005) found that approximately 15% of COPD cases could be attributed to inhaled particles at work such as production of rubber, plastics, textiles and leather, building and construction, armed forces, food, chemicals, petroleum, and coal mines. Others have reported rates between 9% and 31% (Trupin et al., 2003). Difficulty in clearly defining COPD and the relatively small number of studies conducted may have masked the accuracy of the risk of COPD attributed to occupational exposure. All the above investigated industries were associated with lower SES possibly because they involved manual and blue-collar jobs indicating higher likelihood of lower income, education and occupational status.

Farming, due to its association with pesticides, animal contact and dust and particles, has also been implicated in the incidence of COPD (Lamprecht, Schirnhofer, Kaiser, Studnicka, & Buist, 2007) with 7.7% of COPD cases attributed to it and approximately one third of farmers suffering from COPD. Other factors linked to COPD include occupational exposure as in miners (e.g. coal, hard-rock, gold) and people working in tunnels and with concrete. The effect of this exposure – if heavy and prolonged – may supersede even that of smoking (Ulvestad, Bakke, Eduard, Kongerud, & Lund, 2001). Prolonged inhalation of dust, diesel, beauty salon products, textiles, car fumes, food production, silica, iron, steel, brick dust or mineral particles was associated with increased COPD incidence and mortality (Hnizdo et al., 2002; Weinmann et al., 2008). Similarly, Blanc, et al. (2010) found associations between vapour, gas, dust or fumes exposure and increased risk of COPD which showed further increase if this exposure was combined with smoking. Bakke, Hanoa, & Gulsvik (1995) argued that occupational exposure alone does not provide an adequate explanation for the incidence of COPD. They observed a relationship between educational attainment and increased likelihood of experiencing respiratory symptoms even when controlling for occupational exposure (Bakke et al., 1995).

Occupation was associated with income and education although each of them reflects different things (Antonovsky, 1967; Susser, Watson, & Hopper, 1985). For example, occupation is associated with social status while income level reflects spending power and educational attainment can be indirectly related to both. The link between lower SES that includes education and income in addition to occupation and higher prevalence of COPD must be considered. Yin, Zhang, Li, Jiang, & Zhao (2011) found a relationship between educational attainment and household income and increased prevalence of COPD in both urban and rural areas in China when adjusting for age, smoking status, geographical area and passive tobacco exposure. When classified by smoking status, educational attainment and COPD prevalence were still significantly associated both in smokers and non-smokers. This indicated that education might have been a risk factor for COPD independent of smoking. Household income was related to COPD in never smokers, but not in smokers. The authors attributed these differences in the findings to the fact that both education and household income were imperfect indicators of SES. The association between COPD prevalence and educational level was also supported by other studies conducted in Latin America (Menezes et al., 2005). These studies had controlled for confounding factors such as age, sex, ethnic origin, education, pack-years of smoking and exposure to biomass fuels, coal, occupational exposure and BMI.

Kanervisto et al., (2011) found an association between low SES and lower educational level with higher COPD incidence when controlling for gender, age, smoking history, and BMI in a study conducted in Finland confirming previous research in Norway (Bakke et al., 1995). Decreased lung function in lower SES groups in comparison to higher SES populations and increased respiratory symptoms have consistently been reported even after adjustment for smoking (Bednarek, Maciejewski, Wozniak, Kuca, & Zielinski, 2008; Burr & Holliday, 1987; Prescott, Lange, Vestbo, & And The Copenhagen City Heart Study, 1999; Stebbings, 1971). This difference dependent on SES, particularly lower education and income, was also linked to increased risk for admission to hospital (Prescott et al., 1999).

The role of SES in COPD requires increased attention because of its multifaceted nature which includes a variety of socio-economic factors such as financial resources, power or status (Macintyre, Ellaway, Der, Ford, & Hunt, 1998; Roux, 2001; Lynch et al., 1997). SES indicators may also be operating differently in COPD patients depending on age. COPD affects mainly people over the age of 40 years and because its progression is very slow, the disease is more pronounced in later stages of life. An

individual's health status could be affected by different socio-economic factors on various levels (e.g. individual, household or neighbourhood) and in varying ways (e.g. vulnerability, effects on physical status) depending on their age or stage in life (Singer & Ryff, 1997; Steptoe & Marmot, 2002). Educational and income level as well as occupational class might not be able to capture aspects of SES in the same way as in later age as compared to younger adulthood (Braveman et al., 2005; Kaplan, Seeman, Cohen, Knudsen, & Guralnik, 1987; Liberatos, Link, & Kelsey, 1988). SES characteristics held earlier in life such as occupation or education might not be reflected in measures of current SES. For example, loss of income or loss of prestige associated with one's occupational class due to retirement (Kaplan et al., 1987). This highlights the need for more global and homogenous assessment of SES in COPD.

2.2.6 Conclusion

Research findings strongly support an association between low SES and higher risk for the development, severity and prevalence of COPD when examining the most commonly used measures of SES (income, education, occupation). These three measures are related to other indices such as housing, smoking occupational exposure. Pre-natal exposure is associated with SES to a certain degree. The inclusion of these additional SES indicators makes the effect of SES on COPD clearer and uncovers its multifaceted nature and wide extent of operation. There are a number of risk factors that contribute to the risk of developing COPD to varying extents. A combination of these risk factors – with some operating as early as in-utero – may increase an individual's susceptibility to COPD. The evidence so far indicates the existence of not only an association between low SES and increased COPD incidence but also the existence of a socio-economic gradient in COPD morbidity and mortality.

2.3 The role of socio-economic status in health care access (HCA)

2.3.1 Introduction

Socio-economic status in health leads to the wider issue of health inequalities in health care. The inverse care law stated that the provision of good health care tends to be inversely related to the need of the population in receipt of that care (Tudor Hart, 1971). The more deprived the population, the greater the need for more medical treatment but the more barriers exist for these people to acquire access to health care.

Before focusing on health care access, reference to the distinction between health care access and health care utilisation needs to be made. These two terms might be distinct but are not mutually exclusive. Health care access refers to "the ease with which an individual can obtain needed medical services" (RAND Corporation, 2010). The focus in this definition is on the word "can". HCA describes the degree of an individual's ability to approach and receive health services. Access to health care has also been described as the "goodness of fit" between patients and the health care system (Penchansky & Thomas, 1981) referring to the suitability of available health care services to patients' needs. The fact that health care services are available does not necessarily mean that patients will use them when and as needed. Thus, while access to health care denotes both the availability of services as well as people's ability to use them, utilisation of these services refers to the actual use of these services also described as "realised access" (Andersen, 1995). Therefore, health care access is an essential but not sufficient antecedent to health care utilisation. It could be argued that access to healthcare may only be properly assessed in utilisation rates and that under-utilisation could partly be a representation of inadequate access. However, it could also be that people do not utilise health care services despite their ability to do so and the availability of the services. The decision to utilise health care services could be influenced by other factors such as the way individuals perceive their health problem and whether it requires medical attention or not.

Health inequalities have been associated with access to health care. Providing equal access to health care entails one important facet: equity. Equity refers to providing equal opportunity for everybody who has the same needs to have and gain access to health care services. A further distinction is that between horizontal and vertical equity. Horizontal equity refers to fairness in providing health care to people who have the

same medical needs (Mooney, 1983; Gulliford et al., 2002) – in other words, equal treatment for equals. For example, access to primary care services such as GPs or hospital services should be equal for everybody who would need treatment. Vertical equity, on the other hand refers to the provision of unequal health care to people who have different medical needs. For example, people with greater needs should receive higher health care provision such as specialist referrals and treatment.

The most common method of measuring horizontal inequity is the extent of the relationship between health care utilisation and income after accounting for differences in need across the different income levels (Wagstaff, 2002). In theory, horizontal equity in health care access should only depend on the need of the population or the person in question and not on socio-economic factors that may be exerting an influence on the use of these services (O'Donnell, et al., 2008). Research has not found strong support for inequity in horizontal health care access. On the contrary, there has been evidence that in a number of European countries such as Belgium, the UK, the Netherlands and Italy, access to GPs and hospital services favour the lower SES groups (Van der Heyden et al., 2003; van Doorslaer et al., 2006; Sutton, 2002; Masseria & Giannoni, 2010). These countries offer a universal health care system which could account for differences when compared to other countries such as the USA where access depends on insurance status. Findings differ for vertical health care access. The evidence mostly suggests that there is inequity in vertical health care access. For example, for specialist services, the pattern appears to follow the opposite direction namely favouring the higher socio-economic groups (Masseria & Giannoni, 2010; Finkelstein, 2001; Dunlop et al., 2000; Hurley & Grignon, 2006). Still, equity in specialist consultations has been found, for example in Spain, possibly due to different patterns in health care seeking (Regidor, et al., 2008). This was attributed to high expertise and ability of GPs to treat patients eliminating the need for further specialist treatment or high rates of specialist care consultations regardless of socio-economic position (Regidor et al., 2008).

Social determinants of health need to be considered when attempting to explain the pathways underlying the relationship between SES and health care access. These determinants refer to the circumstances in which people are born, raised, work, live and grow old (Marmot, 2009). The curve of a health gradient can fluctuate depending on changes in the political, social, and economic circumstances. This means that the focus of attempts to decrease health inequalities needs to target these three circumstances and their sources (Marmot, 2009). Measuring equity in health care

access is not a straightforward issue. Dimensions such as the variety and different degrees of health problems, differing needs for the same health conditions as well as personal priorities and attitudes need to be considered (Gulliford et al., 2002).

2.3.2 Socio-economic status and health care access (HCA)

Socio-economic factors have been linked to access to health care. For example, low SES was related to delayed and lower quality of care provision (Weissman & Epstein, 1993). Ethnic influence was associated with impaired health care access when controlling for SES factors (Hayward, Shapiro, Freeman, & Corey, 1988). Perneger, Whelton, & Klag (1995) explored the association between differences in ethnic background and socio-economic status in end-stage renal disease (ESRD) based on previous evidence that supported a partial link between them (Navarro, 1990). Perneger et al. (1995) reported that low SES status and lower health care access accounted for approximately 30% of the excess risk for ESRD Black Americans. Pernerger et al.'s (1995) findings showed that the mediating role of health care access between low SES and increased likelihood of getting ESRD in poorer groups was not as strong as expected while impaired access to health care services was an independent risk factor for ESRD. Evans et al. (2011) found differences between Blacks and Whites who had higher likelihood of CKD occurrence regarding availability and quality of health services. Influencing factors included lack of health insurance and variability in the ways Blacks used health services such as seeing a GP privately. Evans et al.'s (2011) findings indicated that lower health care access accounted for higher CKD incidence in Blacks in addition to socio-economic, lifestyle-related and clinical factors.

The effect of ethnic origin was found to be significantly lower than socio-economic factors in some studies. For example, Mutchler & Burr (1991) showed that when controlling for SES variables and resources, the effect of ethnicity disappeared in some measures of health care access. Self-rated health, however, remained worse for Blacks as compared to Whites which suggested that the impact of SES may have been different in the two groups.

Multi-morbidity can also influence access to health care. Glynn, et al. (2011) investigated health care utilisation in primary and secondary care settings and found a

significant positive and linear association with multi-morbidity when adjusting for age, gender and socio-economic status. Health care access measures included consultations with GPs, consultants on an outpatient-basis, hospitalisations and health care expenses. These healthcare access measures – although not comprehensive – reflect patients' access to health care services in different ways. For example, hospitalisations might reflect poor health care access provided in primary care which might result in hospital admission instead of good health care access. Caution must be taken when attempting to interpret the direction of HCA using various measures.

Wagner, et al. (2011) explored the relationship between household income and health care provision including medicines aided by health insurance and public sector resources. The study used the World Health Survey data collected based on reports from 70 countries (WHO, 2003). Access to emergency care was found for more than 90% of households. People suffering from a chronic illness reported significantly lower access with less than 50% of them utilising health services when needed. Costs associated with health care access in low and middle income countries place a significant burden on family income. Wagner et al. (2011) concluded that lack of health insurance and lack of contribution from the public sector were related to impaired access and increased financial burden for households. More support for the association between low SES and increased likelihood of consulting a GP and receiving prescriptions for medication was reported by Van Der Meer, Van Den Bos, & Mackenbach (1996) and Bongers, Van Der Meer, Van Den Bos, & Mackenbach, (1997). The latter group found that higher SES was linked to increased specialist consultation but lower GP consultation in comparison with lower SES groups when controlling for health status. The authors suggested that other factors such as distance to health service facilities, time and cost of travelling, doctor-patient communication as well as people's attitudes and values may contribute to the way people seek health care access. These factors are discussed in more detail in Chapter 3.

2.3.3 Health care access in COPD

Research examining health care access in COPD is relatively limited. The main dimensions in relation to health care access in COPD that were examined included doctor-patient communication, prescriptions for medication and hospital admissions. Because of the higher incidence of COPD in lower SES groups, and taking into

consideration the evidence for the link between lower SES and more impaired HCA, it would be expected that health care access would be lower in patients with COPD given their more deprived background. However, Goldstein, Concato, Bradley, O'Leary, & Fried (2005) investigated communication between physicians and patients focusing on discussion of prognosis. Higher likelihood of discussion regarding prognosis was associated with lower SES and non-white ethnic background. However, participants in this study were seriously ill and included patient groups with different conditions (congestive heart failure, cancer and COPD). These results do not support previous findings which reported a relationship between non-white ethnicity and lower SES with worse patient-physician communication specifically in regards to end-of-life care (Borum, Lynn, & Zhong, 2000; Collins, Clark, Petersen, & Kressin, 2002) and higher likelihood of discussion of prognosis in cancer patients with increased SES (Ward, 1974). Goldstein et al. (2005) suggested that their findings could be attributed to poorer patients of non-white ethnicity being more "attuned" to hearing bad news and accepting it. A second suggestion was that physicians may have focused more on providing this information to specific groups especially since some of them were more likely to prefer life-sustaining care (McKinley, Garrett, Evans, & Danis, 1996; Krumholz, et al., 1998).

a. Smoking referrals

A number of strategies have been introduced in the UK since 1998 to reduce smoking rates and help smokers quit (Callum, 1998; Reid, Killoran, McNeill, & Chambers, 1992) such as a national network of smoking cessation services (National Health Service (NHS) Stop Smoking Services (SSS); McNeill, Amos, McEwen, Ferguson, & Croghan, 2012). This led to a significant reduction in cigarette smoking, but not in socio-economic inequalities in smoking (Hiscock et al., 2011; Kotz & West, 2009). While smoking decreased in higher SES groups in England from 22.8 to 19.4% between 2001–03 and 2006–08, it did not decrease in the more deprived groups (42.6 versus 42.4%) (Hiscock et al., 2012). This led to a decrease in inequalities between the two groups but not in a mutual trend. This means there was a decrease of smoking in higher and lower SES groups resulting in lower inequality. Stopping smoking services aimed to reach more deprived smokers and attempted to decrease health inequalities at the same time (Bauld, Judge, & Platt, 2007). However, fear of being judged, of failing and insufficient or distorted knowledge about smoking cessation services and the

associated medication available were perceived barriers in the uptake of services and success in smoking cessation (Roddy et al., 2006). Success of smoking cessation increases with age because of higher likelihood of adherence to a programme and lower risk of relapse. More deprived and minority populations are less likely to succeed in quitting smoking due to their more disadvantaged situation and attitudes that make cessation harder to undertake. Both of these are associated with poorer preventive health care in comparison to more affluent groups in the UK and the US (David, Esson, Perucic, & Fitzpatrick, 2010; Fagan, Shavers, Lawrence, Gibson, & Ponder, 2007; Hiscock, Judge, & Bauld, 2011). These treatment inequalities could be attributed to physician beliefs about minority and low SES patients (van Ryn & Burke, 2000). They could also be due to the nature of the healthcare system that leads to fatigue, work overload, and time constraints all of which raise the risk for discrimination in thinking and treatment patterns (Burgess, Fu, & Van Ryn, 2004).

In the UK, the introduction of the Quality and Outcomes Framework (QOF) system in primary health care contributed to recording patients' smoking status at least every 27 months and offering cessation advice. This was not always feasible due to significant proportions of people, mainly from lower SES or hard-to-reach groups, not registered with primary healthcare teams.

No research is available examining the association between lower SES and smoking cessation referral rates in COPD patients at this time. However, the existence of inequalities in smoking cessation services indicate that more deprived groups might be at a disadvantage of receiving them. This would pose a significant problem especially for patients with COPD since stopping smoking is the main approach to prevent further deterioration of the disease.

b. Pulmonary Rehabilitation (PR)

Pulmonary rehabilitation (PR) referral and attendance are important dimensions of health care access in COPD. PR is an exercise and educational programme which has been proven beneficial in facilitating breathing, enhancing exercise performance, improving health status and increasing patients' perceptions of control over their COPD (Lacasse, Goldstein, Lasserson, & Martin, 2006; Nici, et al., 2006). PR has also contributed to reductions in exacerbation rates and hospital admissions as well as duration of stay (Griffiths, Phillips, Davies, Burr, & Campbell, 2001; Guell, et al., 2000).

However, attendance and completion rates in PR have been low with approximately 1.5% of COPD patients accessing PR annually (Yohannes & Connolly, 2004). In a systematic review exploring the barriers associated with PR attendance and completion, Keating et al. (2011) found that lack of means of transportation as well as perceptions of no benefit from PR were associated with attendance rates. Current smoking and depression were related to lower completion rates. The authors stressed that they had not taken into account patients who had rejected PR at the time of referral and that the number of referrals offered had not been well-documented. According to Young, Dewse, Fergusson, & Kolbe, (1999) approximately 30% of patients are offered PR referrals.

c. Prescriptions

Important aspects of access to health care in COPD include provision of appropriate medication as well as rates and accuracy of diagnosis (Foster, et al., 2007; Snider, 1989). The role of SES in medication use in patients with COPD is not clear. Restrepo, et al. (2008) did not find any significant associations between educational attainment and medication use which contradicted earlier findings suggesting that higher education was related to better adherence in nebuliser use (Turner et al., 1995). Decreased likelihood of adherence was associated with patients' perceptions of no significant beneficial effect of inhaler use on their breathing, lower educational attainment as well as forgetting to take the inhalers and prescriptions charges (Dolce, et al., 1991; Turner, Wright, Mendella, & Anthonisen, 1995). A socio-economic gradient was observed regarding self-reported use of tiotropium with lower SES groups reporting decreased intake of tiotropium (Blanc, et al., 2008).

d. Exacerbations and hospitalisation

Treatment needs for COPD patients who experience exacerbations and are hospitalised constitutes one further aspect of health care access. However, both exacerbations and admissions are considered more a measure of outcome of disease rather than of health care access (Prescott et al., 1999). Limited access to primary care

services such as GP consultations and lack of prescriptions could lead to deterioration of the illness and thus contribute to higher likelihood of exacerbations. Therefore, exacerbations and hospital admissions could be the result of more limited access to health care. Prescott et al. (1999) found a significant association between education and income and hospital admissions in COPD. An association between educational attainment and low income and hospital admissions was also found by Miravitlles et al. (2006) and Agabiti et al. (2009). Miravitlles et al. (2006) suggested that impaired health status was a predictor of increased risk as well as a consequence of exacerbations and admissions. If decreased health care access was associated with impaired health status then this could suggest that exacerbations and admissions would be more frequent as a result of poor health. Begley et al. (1994) found evidence for lower SES and impaired access to primary care services leading to increased hospital admission rates. Limitations of the study included lack of adjustment for confounding variables such as higher occurrence of disease, quality of care by health professionals and patient choices. Begley et al. (1994) emphasised that additional factors apart from lower health care access could be associated with the increased number of preventable hospital admissions. Apart from COPD, asthma, urinary tract infections, diabetes, pneumonia and epilepsy were also included in the study. Thus, results cannot be generalised to COPD patients only although the effect was strongest in COPD as compared to the other conditions. More support for the association between poorer access to health services and increased rates of admissions was provided by Bindman, et al. (1995) for COPD, asthma, hypertension, diabetes and congestive heart failure. Self-reported health care access as well as incidence of illness, medical treatment seeking and physician care patterns were included in the analyses. Results showed that limited access to health care services was linked to increased hospital admissions for all five conditions when adjusting for SES factors, demographics, individual patterns of health care seeking and physician practice routines. Self-rated access to health care was more impaired in lower SES areas.

2.3.4 Conclusion

Health care access is a multi-dimensional concept that involves a variety of factors influencing horizontal and vertical equity in health care access. Firstly, socio-economic status relates to people's ability to access health care on the basis of health insurance

and other barriers associated with expenses incurred in the process of access (McCarrier, Zimmerman, Ralston, & Martin, 2011; Quinn, et al., 2011). Secondly, behavioural factors which include psychological, lifestyle and cultural elements can influence actual utilisation of health services available such as GP visits or prescription uptake (Gulley, Rasch, & Chan, 2011). Third, location-related factors such as distance, duration of travel, means of transport available as well as the supply of health care services in certain areas exert a significant influence on people's ability to access health care services (Comber, Brunsdon, & Radburn, 2011; Masseria & Giannoni, 2010).

The mechanism of influence of the factors discussed above as well as contradictory evidence for the relationship between SES and health care access highlight the degree of caution that needs to be taken when examining health care access in different population groups and health conditions. A combination of all these dimensions is required to provide detailed insight into the causes and correlates of health care access, which can set the ground for targeting the barriers and improving access to services.

2.4 The role of socio-economic status in quality of life (QoL)

2.4.1 Introduction

Quality of life data aids in monitoring population's health status and contributes to the identification of health inequalities and information of public policy. In the clinical field, quality of life also provides evaluation of the impact of interventions on health outcomes (Moriarty, Zack, & Kobau, 2003).

The definition, dimensions, measurement and external influences on QoL has been debated for years (Taillefer, Dupuis, Roberge, & LeMay, 2003). Quality of life encompasses different dimensions including physical, psychological and social functioning and well-being and perceptions of health (Hennessy, Moriarty, Zack, Scherr, & Brackbill, 1994; Siegrist & Junge, 1989).

Quality of life may also refer to wider elements including functional ability, happiness or level of satisfaction, goal attainment and social network availability (Dupuis, et al.,

2000; Ferrans, 1990; Meeberg, 1993). According to Feinstein (1987) “the idea (of QoL) has become a kind of umbrella under which are placed many different indices dealing with whatever the user wants to focus on”. Objective health status of life is different from subjective quality of life (Cummins, Yuan, Yuen, & Low, 1999). These two variables are not strongly correlated. Arguments against the use of both have been raised such as that subjective well being does not necessarily reflect the availability of material and social resources. One person may perceive himself to be well despite adverse conditions in his social or financial environment. Another person, despite having sufficient financial and social resources, may report a low level of subjective well being (Hagerty, et al., 2001). Cummins (2000) emphasised that quality of life should not be defined in subjective terms (people’s perceptions of their well-being) but also in objective dimensions (e.g. social network connections) and should be measured in both dimensions in order to reflect the global view of quality of life.

The use of QoL measures which include a variety of domains has been supported in the literature (Kaplan & Ries, 2007). In the current study, quality of life was defined as perceived well-being in terms of physical, social and psychological status.

2.4.2 Socio-economic status, health status and quality of life

Quality of life refers to general well-being and health is influenced by a range of factors not only in people’s immediate environment but also by personal characteristics such as socio-economic status and life events (Brown, 1995; MacIntyre, MacIver, & Sooman, 1993; Mattevi, Bredemeier, Fam, & Fleck, 2012). Lower socio-economic status and poorer self-rated levels of well-being has been associated with worse health (Mackenbach & Britain, 2006). The effect of SES on health status can follow various pathways such as lower access to health care services including lack of preventive services such as screening (Blendon, Aiken, Freeman, & Corey, 1989; Hayward et al., 1988). Lack of insurance and poverty increase the likelihood of poorer quality and lower provision of care (Burstin, Lipsitz, & Brennan, 1992; Weissman et al., 1991).

Quality of life reflects a person’s subjective health status and their perception of their well-being on a physical, social and psychological level. Two people might have identical conditions or symptoms, but their experience of them may vary significantly. A number of factors are associated with this difference of experience such as the

availability of social networks, the conditions people live in and their expectations from life itself (Mattevi et al., 2012). The subjective nature of the experience of QoL is reflected in the "response shift". Response shift has been defined as "a change in the meaning of one's self-evaluation of a target construct as a result of: (a) a change in the respondent's internal standards of measurement (scale recalibration, in psychometric terms); (b) a change in the respondent's values (i.e. the importance of component domains constituting the target construct); or (c) a redefinition of the target construct (i.e. reconceptualisation)" (Schwartz & Sprangers, 1999; Sprangers & Schwartz, 1999). Chronic illness patients may adjust their baseline for their experience of symptoms and well-being as long as their condition is not deteriorating any further. Despite their well-being baseline being lower than before the emergence of their illness, patients can adjust to it and perceive it as "normal" after a period of time because it has become their new baseline.

a. Educational attainment, occupational status, income level and QoL

Bowling & Windsor (2001) found that expectations of QoL may vary depending on educational attainment. People who were more educated reported poorer quality of life. This was attributed to people having set a higher threshold for life expectations in this group and experienced greater disappointment if their goals were not achieved in their work or personal environment compared to groups who were less educated.

The evidence also indicates that more deprived individuals might perceive their quality of life to be poor when experiencing a health problem likely to be deteriorating due to limited socio-economic resources. Mielck, Reitmeir, Vogelmann, & Leidl (2012) used the EQ-5D because it could capture health inequalities (König, et al., 2010) which included five dimensions relating to quality of life (degree of mobility, self-care, usual activities, pain/discomfort and anxiety/depression). Results showed that all dimensions of quality of life that were assessed were more prevalent in the group with lower educational attainment when adjusting for age and sex. Further analyses conducted on subgroups of participants who were suffering from a chronic illness revealed a relationship between lower educational attainment and decreased quality of life as compared to the higher education group.

Similarly, Regidor, et al. (1999) observed a positive association between educational attainment and quality of life in a non-institutionalised population aged over 15 years in Spain. Differences in self-rated health status between educational levels were examined using the SF-36 Health Survey. People with higher education (university) rated their quality of life better than people with lower educational level (primary and secondary). This relationship was linear; the higher a person's education the better the self-rated health. This was consistent with Ross & Mirowsky's (2011) findings who observed a social gradient in quality of life based on both income and education. Higher educational attainment and higher income were associated with better QoL. Increasing age was linked to decreased QoL in women from the upper-middle and highest levels of the socio-economic scale in comparison to women from lower SES groups. Ross & Mirowsky (2011) concluded that QoL followed a gradient which was dependent on income and education and exerted its influence starting in the early years of adulthood and persisting into late adulthood.

b. Neighbourhood environment and QoL

The effect of the immediate neighbourhood environment was examined in relation to four different dimensions of QOL: physical, psychological, social, and environmental by Mõttus, Gale, Starr, & Deary (2012) in a population aged 68 to 71 years in Edinburgh. Although some aspects of quality of life such as physical functioning and environmental satisfaction were independently related to neighbourhood deprivation, other aspects such as psychological and social functioning were not. Education and occupation were adjusted for in the analyses. The number of a person's co-morbidities such as stroke, arthritis or diabetes, was not only linked to both quality of life and neighbourhood deprivation but also mediated this relationship. Mõttus et al. (2012) concluded that neighbourhood environment exerted a significant influence on the way residents rated their quality of life in various aspects.

Neighbourhood deprivation was associated with poorer physical health status in people of more advanced age (Mõttus et al., 2012). In their systematic review, Yen, Michael, & Perdue (2009) stressed that the evidence for this association was only moderate and did not indicate which aspects of the neighbourhood environment were linked to health status. However, the criteria used in the review, the cross-sectional nature of the

studies and the non-comprehensive inclusion of databases might have influenced findings.

Associations between neighbourhood quality and perceived quality of life in older people were also investigated by Webb, Blane, McMunn, & Netuveli (2011) in the English Longitudinal Study of Ageing. In this study, quality of neighbourhood included elements such as vandalism, trust, support amongst others and quality of life was measured with the CASP-19 which assessed perceived control, independence, satisfaction and self-realisation (Hyde, Wiggins, Higgs, & Blane, 2003). Four years after baseline, findings suggested that neighbourhood quality was independently related to self-reported quality of life, which echoed Wiggins, Higgs, Hyde, & Blane's (2004) and Yohannes & Connolly's (2004) results.

Previous research has provided evidence for an association between neighbourhood deprivation and increased incidence of depression and anxiety independent of individual-level socio-economic factors (Fone, et al., 2007; Galea, et al., 2007; Sundquist & Ahlen, 2006). Walters, et al. (2004) found that residing in areas of high deprivation and specifically high population density was related to depression but this effect disappeared when individual-level deprivation characteristics were controlled for. Their findings indicated that population density rather than deprivations was related to anxiety. Walters et al. (2004) concluded that individual-level characteristics and health status mediated the effect of area deprivation on depression. The cross-sectional design and limitations in measuring the expected dimensions of SES, health care utilisation or environmental factors should be considered when attempting to draw conclusions.

Studies in Sweden, the United Kingdom and The Netherlands (Lofors, Ramírez-León, & Sundquist, 2006; Propper, et al., 2005; Reijneveld & Schene, 1998) did not find an association between depression and anxiety and neighbourhood deprivation when adjusting for individual-level socio-economic status. Gale, Dennison, Cooper, & Sayer (2011) claimed that it was not neighbourhood deprivation per se that was associated with population mental health based on their results from in a cross-sectional study conducted in Hertfordshire with residents aged 69-78 years. Elements of social capital such as sense of cohesion in the neighbourhood were linked to better mental health. Characteristics such as physical limitations, for example mobility or disability or availability of social support were significantly related to better mental health. The authors attributed the lack of association between neighbourhood deprivation and

psychological health to increased levels of neuroticism. The importance of neighbourhood quality was attributed to the fact that older people, due to mobility or disability issues, may spend more time at home and thus are more exposed and dependent on the effect of their immediate environmental factors (Yen et al., 2009).

c. SES and QoL in chronic illness

Montazeri, Hole, Milroy, McEwen, & Gillis (2003) investigated whether quality of life differed in patients who had recently received a diagnosis of lung cancer depending on their socio-economic status. QoL was assessed with the Nottingham Health Profile (NHP), the European Organization for Research and Cancer Treatment Quality of Life Questionnaire (EORTC QLQ-C30) and its supplement for lung cancer (QLQ-LC13) at baseline and three months after the first treatment. Socio-economic status was measured using the Carstairs and Morris Deprivation Category, a composite score. Results showed that over half of the patients with lower SES reported increased health problems and symptoms as well as impaired functioning in comparison to higher SES individuals. Patients from both SES groups appeared to have responded similarly to treatment in certain aspects of quality of life such as physical mobility, energy levels, role functioning, physical functioning, and breathlessness between baseline and at follow-up. Montazeri et al. (2003) suggested that quality of life was not only associated with the illness and its treatment but also significantly linked to patients' socio-economic status.

Lower socio-economic status was linked to poorer quality of life in prostate cancer patients using annual income as an index of SES (Penson, et al., 2001). When education was used to assess SES results did not support this link (Litwin, McGuigan, Shpall, & Dhanani, 1999). Early prostate cancer patients with higher education were slower in returning to baseline QoL 1 year after prostatectomy (Litwin et al., 1999). However, wealthier and more educated participants were over-represented in the participant sample.

Barbareschi, Sanderman, Kempen, & Ranchor (2009) reported that increased social, physical and role functioning was observed in CHD patients from higher SES groups as compared to lower SES groups 1 year post-diagnosis. However, Barbareschi et al.

(2009) noted that the attrition rate in their study was high and that may have biased the results in the direction of less severe CHD and lower levels of depression and anxiety.

Mental and physical quality of life in end-stage renal disease (ESRD) was poorer in lower SES patients in comparison to higher SES groups and had deteriorated further at follow-up (Sesso, Rodrigues-Neto, & Ferraz, 2003). SES did not only affect short-term quality of life in ESRD but also persisted in the long-term. Sesso et al. (2003) attributed this effect to people with higher SES being more able to cope with both stress and the burden of the disease physically and emotionally. In the lower SES group, limited or impaired availability of resources and social support may have had a negative effect on patients' QoL. A small sample size and the use of the SF-36 to assess QoL – which was not disease-specific for ESRD – may have prevented identification of additional relationships.

Harris, Luft, Rudy, & Tierney (1993) found that low SES in terms of income, educational level and employment was associated with increased levels of disability in patients with chronic kidney failure. Higher income and education were related to improved well-being in moderate to advanced renal failure patients (Rocco, Gassman, Wang, & Kaplan, 1997) and patients on dialysis (Moreno, Gomez, Sanz-Guajardo, Jofre, & Valderrabano, 1996). However, investigation of the relationship between SES and QoL was not the aim of these studies and the methods of measuring SES were not reported in detail. This warrants caution when interpreting findings.

2.4.3 Socio-economic status and quality of life in COPD

QoL is an important factor for prognosis in COPD (Balcells, et al., 2010). For example, impaired quality of life in COPD patients has been linked to higher risk of hospital admission, mortality and morbidity when disease severity was adjusted for (Domingo-Salvany, et al., 2002; Osman, Godden, Friend, Legge, & Douglas, 1997; Sullivan, Ramsey, & Lee, 2000).

The majority of research has investigated the relationship between QoL and various aspects of COPD such as lung function decrease, exercise performance, degree of dyspnoea, number of co-morbidities and treatment efficacy (Ferrer, et al., 1997; Ketelaars, et al., 1996; Sullivan, Buist, & Weiss, 2003; Wijnhoven, Kriegsman, Hesselink, De Haan, & Schellevis, 2003; Wijnhoven, Kriegsman, Hesselink, Penninx, &

de Haan, 2001). Sleep difficulties, physical and mental disturbances such as low oxygen level, depression, anxiety, and even demographic characteristics such as socio-economic factors, age and environmental irritants can also influence QoL in COPD (Eisner, et al., 2010; Engström, Persson, Larsson, & Sullivan, 2001; Jones, 1991; McSweeny, 1982; Okubadejo, Jones, & Wedzicha, 1996; Prigatano, Wright, & Levin, 1984; Ternesten-Hasséus, Larsson, & Millqvist, 2011; Balcells et al., 2010). Quality of life is significantly impaired in patients with COPD in comparison to healthy populations and is poorer with increasing level of disease severity (Ketelaars et al., 1996; Okubadejo et al., 1996; Ferrer et al., 1997). Due to the association between severity and QoL, the need to adjust for disease severity in analyses to eliminate confounding effects is highlighted.

Ethnic differences can have an impact on QoL in COPD (Han, et al., 2011). When controlling for confounding variables such as FEV_1 , dyspnoea, smoking history, SES variables, prior exacerbations, QoL was similar in Caucasians and African American patients with COPD without exacerbations but worse for the latter group with exacerbations. This was observed despite the lack of significant difference in frequency of exacerbations between Caucasians and African Americans (Han et al., 2011). The authors concluded that the impact of hospitalisation was more severe on African Americas than on Caucasians suggesting that this could be attributed to socio-economic, cultural or biological factors. For example, increased admission rates to intensive care unit for African Americans were an indicator of their higher vulnerability to more severe exacerbations (Sarrazin, Cannon, Rosenthal, & Kaldjian, 2009). Ethnic disparities could affect provision of treatment for COPD patients such as prescriptions for oxygen at home, vaccinations, and smoking cessation referrals due to health professionals' stereotypes or biases against certain ethnic groups. Ethnic minority background could be associated with lower SES reflected in lack of health insurance and access to primary care physicians as well decreased lung function, all of which could possibly increase the likelihood of exacerbations (Chandra et al., 2009; Dransfield & Bailey, 2006)

Despite evidence for the association between SES and QoL the exact pathways through which this influence is exerted still remains elusive. A variety of mechanisms have been proposed such as impaired health care access and biological vulnerability (Chandra et al., 2009; Dransfield et al., 2006). Other explanations include decreased mobility which prevents patients from full-time employment and therefore inability to finance treatment or insurance premiums which are considerably high in COPD

(Sullivan, et al., 2000). Saadat et al., (2007) emphasized that low SES was a significant factor in impaired QoL in COPD patients and noted that this effect was more apparent in COPD as compared to other conditions (Prescott & Vestbo, 1999). Evidence of a socio-economic gradient in QoL in COPD according to income level was found despite the fact that Saadat et al. (2007) had matched participants according to SES, co-morbidities and type of insurance to decrease likelihood of bias.

2.4.4 Conclusion

The evidence supporting the link between lower SES and poorer quality of life across a number of diseases is irrefutable. It also highlights the multifaceted nature of SES involving different elements such as educational attainment, occupational status, income levels and neighbourhood deprivation. Therefore, it is vital for studies that examine SES in relation to HCA and/or QoL to consider assessing SES in various ways in order to capture its full impact on these outcomes especially in diseases associated with low SES such as COPD.

2.6 Social capital and health

Socio-economic deprivation manifests itself both in the material and in the social domain. Lack of income and limited material resources contribute to poorer quality of life and well-being through deprivation of amenities, comfort and security (Geyer & Peter, 2000; Lynch & Kaplan, 2000). Social resources such as availability of social networks and social support as well as group activities and interactions are important for people's well-being (Berkman & Breslow, 1984). Decreased participation of lower SES groups in social, recreational and cultural activities, limited and unstable social networks can lead to social exclusion. This exclusion can also be accompanied by a sense of deprivation in terms of social rewards which, in turn, contributes to deterioration of self-rated health and can increase symptoms of depression (Berkman, Glass, Brissette, & Seeman, 2000; Siegrist, 2000; Stansfeld, Fuhrer, Shipley, & Marmot, 2002).

The availability of social networks, social cohesion, trust and activities in the community are embedded within a wider concept which is termed social capital. Social capital is defined by Lynch & Kaplan (1997) as "the stock of investments, resources and networks that produce social cohesion, trust and a willingness to engage in community activities". Social cohesion is described by Wilkinson (2002) as "the social nature of public life, dominated by peoples' involvement in the social, ethical and human life of the society, rather than being abandoned to market values and transactions. People come together to pursue and contribute to broader, shared social purposes". Therefore, a social environment that includes an increased number of networks providing participation as well as a high degree of social trust and reciprocity can lead to better health. Decreased social cohesion and trust were associated with increasing inequality between wealthier and poorer groups in society (Kaplan, Pamuk, Lynch, Cohen, & Balfour, 1996; Kawachi & Kennedy, 1997; Kennedy, Kawachi, & Prothrow-Stith, 1996; Wilkinson, 1994).

Kawachi, Kennedy, Lochner, & Prothrow-Stith (1997) found a strong relationship between social capital and income inequality and mortality. A strong but negative association between the magnitude of this gap and the degree of social capital investment between wealthy and poor groups was observed. This indicated that one route through which financial inequality had an impact on mortality was through limited investment in social capital. Kawachi et al. (1997) suggested that the sources of financial inequality and limited investment in social capital could be attributed to attitudes existing in society which had not yet been measured such as low levels of trust (Brehm & Rahn, 1997). Social capital mediated the relationship these two dimensions (Kawachi et al., 1997). However, the study was cross-sectional which limited identification of causal relationships and not all factors that could have been implicated in the relationship between income inequality and social capital were investigated.

Christakis & Fowler (2007) claimed that networks are associated with biological and behavioural traits of obesity observing that obesity seemed to be spreading through people's social interactions and relationships. Christakis & Fowler (2008) argued further that people's smoking and happiness are influenced and are dependent on the smoking and happiness of other people with whom they maintain connections found in up to three degrees of separation. These studies highlighted the importance of social interaction and community ties between individuals and the possibly collective nature of health-related phenomena. These findings indicated that social capital and health may

be associated but the mechanism underlying this association is still unknown (Abbott & Freeth, 2008).

Veenstra (2002) claimed that social capital and income inequality may be associated with people's health but that their relationship was not clear. Veenstra (2002) suggested that the relationship between mortality and income inequality was stronger than that between social capital and mortality. Similarly, Drukker, Kaplan, Feron, & Van Os (2003) examined the relationship between socio-economic status and social capital on children's health-related quality of life in the Netherlands and found associations for both in regards to children's general health status and satisfaction.

One of the difficulties in exploring the relationship between social capital and health is social capital itself. Social capital is a relatively wide concept (Abbott & Freeth, 2008). Putnam (1993) referred to social capital as 'social trust, norms of reciprocity, networks of civic engagement, and successful cooperation'. Other studies focus specifically on social relations and support (Cooper, Arber, Fee, & Ginn, 1999; Coulthard & Britain, 2002). These concepts are not necessarily mutually exclusive but could be supplementing each other (Putnam, 1993). The challenge lies in the fact that these elements are linked to different domains. While social relationships and collaboration reflect behavioural patterns, trust and reciprocity reflect people's attitudes (Harpham, Grant, & Thomas, 2002; Johnston & Soroka, 2001). The difficulty in defining the components of social capital makes its measurement and examination more complex. In an attempt to investigate how these components may be linked to health, two of them – trust and reciprocity – are discussed in further detail below.

- Trust and health

Various elements of social capital including trust were examined as to their association with health (Hurtado, Kawachi, & Sudarsky, 2011). High level of interpersonal trust was related to decreased likelihood of poor self-rated health when controlling for demographic variables.

Fujiwara & Kawachi (2009) conducted a twin study in the US investigating whether differences in physical and mental health between twins were associated with differences in their reports of social capital. The twin who reported receiving higher

levels of trust also reported better physical health. Positive associations between self-rated health and various measures of social capital have been observed (Carlson, 2004; Lindström, 2004; Subramanian, Kawachi, & Kennedy, 2001). Sundquist & Yang (2007) found that individuals living in neighbourhoods with the lowest levels of linking social capital had a significantly higher risk of poor self-rated health than individuals living in neighbourhoods with the highest levels of linking social capital. The authors suggested that this relationship might be due to opportunities for interaction across the power gradient (Szreter & Woolcock, 2004) available to individuals living in neighbourhoods with well-functioning social networks and high levels of horizontal and vertical trust. These individuals might perceive more power and greater control over their lives. In contrast, limited opportunities for social interaction in neighbourhoods with lower social functioning could lead to stress due to powerlessness or lack of control. This stress could be involved in the relationship between low neighbourhood linking social capital and poor self-rated health.

Low levels of social trust were related to income inequality (Brehm et al., 1997). Increasing income inequality significantly predicted decreasing interpersonal trust. Decrease in interpersonal trust was associated with low civic engagement which suggested that people who trusted others less were more likely show lower participation in societal activities.

Chappell & Funk (2010) found a direct relationship between income and general perceived health as well as physical functioning. No direct association was found between health status and educational attainment or any of the social capital elements (social participation and trust). Indirect effects, however, showed that trust was significantly associated with health through its effect on self efficacy. Chappell & Funk (2010) emphasised that it was not social participation but trust that was related to health. They suggested that the concept of social capital may have more validity on a collective level echoing previous research by Veenstra (2000) who did not find a evidence for social participation and health status. Veenstra (2000) questioned the benefit of social capital on the individual level but stressed that individual benefits could still be obtained through collective social participation and trust.

Happiness appears to be influenced by trust (Layard, 2005). Others claimed that it is wealth rather than trust that promotes better health (Halpern, 2005) based on the assumption that richer countries also have higher levels of trust. When this association was adjusted for wealth, the effect weakened significantly supporting this view.

There are various pathways through which social trust may exert its influence on health. Trust may not have a direct effect on health but could be mediating the relationship between health and other elements of social capital. For example, social networks that people have developed are based on trust and associated with better health (Berkman, 1995; House, Landis, & Umberson, 1988). Lack of trust and suspicion led to social isolation which was associated with impaired health (Glass & Balfour, 2003) especially in older people.

Trust has an impact on social anxiety promoting feelings of security and safety (Wilkinson, 2000). This could decrease the likelihood of chronic stress which was associated with poorer health especially with cardiovascular disease and increased blood pressure due to high strain, pressure and stress levels at work and at home (Greenwood, Muir, Packham, & Madeley, 1996). Cohen, Janicki-Deverts, & Miller, (2007) found that prolonged stress was linked to adverse health outcomes such as higher risk of depression, diabetes, autoimmune conditions and respiratory infections as well as impaired wound healing. Possible immunological pathways were suggested as explanatory mechanisms indicating that chronic stress was linked to inflammation in the body which contributes significantly to the onset and progression of a variety of diseases (Cohen, et al., 2012).

Hibino, et al. (2012) found a negative association between social trust and safety in the neighborhood and self-rated health but not for social participation. When analyses controlled for demographic variables and SES, social trust was still negatively related to poor self-rated health. This study was conducted in Japan and possible differences in cultural and social factors need to be taken into consideration when interpreting the findings.

Neighbourhood issues could be associated with chronic stress independent of social capital (Steptoe & Feldman, 2001). More affluent neighbourhoods were rated as having higher social capital. They displayed stronger social cohesion and controls, higher levels of trust and mutual support. In contrast, neighbourhoods with weaker informal social controls were associated with problems, for instance, littering and walking after dark. These issues would be expected to be more critical in areas where antisocial behaviour is not prohibited. Relationships found between neighbourhood problems and social cohesion and control were moderate which – according to Steptoe and Feldman (2001) – indicated that there was not only an overlap in the measures but that they were also measuring distinct phenomena. Self-reported health, distress, decreased

physical functioning were linked to problems in the neighbourhood. These problems showed positive associations with deprivation on an individual level but negative correlation with social capital. Analyses had adjusted for age, sex, SES neighbourhood and individual deprivation level. Still, the difficulty in clearly defining and measuring social capital needs to be taken into consideration when interpreting these results.

The effect of social capital in terms of trust and social support extends to health behaviours. Giordano & Lindström (2011) reported that smoking was significantly associated with marital and occupational status as well as with components of social capital. Income, social class and health status were not associated with smoking behaviour change. Giordano and Lindström (2010) concluded that psychosocial domains such as being married or employed and components of social capital such as increased trust and participation were important in aiding people to quit or not initiate smoking in the first place. Their findings provided support that social capital and marital status and employment were significant factors in quitting smoking probably not only for the financial security they provided but also through provision of social support.

Considerable evidence for the association between social capital and health exists. However, measurement difficulties and different components of social capital were associated with different outcomes. But does social capital also play a role in health care access and quality of life in patients with COPD and in what ways?

2.6.1 Social capital and COPD

No published evidence has been found to the time of writing this research that has investigated the association between social capital and COPD. Since social capital includes elements such as social participation or social networks, these aspects can – in theory – also be used as social capital measures when examining research on social capital and COPD.

Progressive decline in pulmonary function associated with physical limitations can lead to social isolation and negative affect in patients with COPD due to loss of independence and feelings of self-blame (Guthrie, Hill, & Muers, 2001; Leidy & Haase, 1999; Nicolson & Anderson, 2003; Toms & Harrison, 2002). Integration with the social environment and provision of social support were significantly associated with health status and outcomes (Cohen, 2004). COPD patients were more likely to enjoy social

participation, and the giving and taking in their social environment despite their physical impairments (Mars, Kempen, Mesters, Proot, & van Eijk, 2008; Williams, Bruton, Ellis-Hill, & McPherson, 2007).

Pulmonary rehabilitation (PR) can provide access to social networks and participation for patients with COPD. PR is a course that targets COPD management and rehabilititation and also provides support with coping with the illness (GOLD, 2011; Lacasse et al., 2007; Lacasse et al. 2006). PR is usually conducted in groups and involves an exercise regime and counseling on diet and education COPD.

PR was positively associated with peer and health professional support through provision of renewed hope, increase in patients' perceptions of control and self-confidence, renewal of their engagement in social activities and stronger participation in society (Arnold, et al., 2006; Chan, 2004; Monninkhof, et al., 2004; Norweg, Bose, Snow, & Berkowitz, 2008; Wilson, O'Neill, Reilly, MacMahon, & Bradley, 2007; Toms & Harrison, 2002).

Halding, Wahl, & Heggdal (2010) observed that integration of patients in their PR groups as well as social support received from health professionals was very important for participating COPD patients. PR offered them the opportunity to engage with other people, exchange experiences and knowledge. It also encouraged provision and receipt of trust and support among patients and reinforcement of their self-confidence to manage their illness and extend their social participation. These elements were, in turn, related to improved adaptation and coping with COPD as well as improved quality of life. Halding et al. (2010) found that lack of trust towards the health care system due to past experiences was likely to prevent patients from integrating successfully into their PR groups. However, the authors emphasized that the findings might not be generalisable due to the characteristics of the geographical area in which participants resided. The location was relatively isolated which might have limited social networking among patients due to physical distance. A second reason was that 15 out of the 33 PR participants approached did not participate in the study which could have biased the results because these patients could have experienced and received social support in a different way.

The main message derived from Halding et al.'s (2010) study was COPD patients' desire to experience a sense of belonging to a social group and to develop social relationships that could offer them support. This was also stated by patients with COPD who were socially isolated due to their disease (Guthrie et al., 2001; Leidy & Haase,

1999; Nicolson & Anderson, 2003; Toms & Harrison, 2002) which led to reduced ability to relate to other people (Gullick & Stainton, 2008; Jónsdóttir & Baldursdóttir, 1998). Kara & Mirici (2004) also found an association between loneliness and depression which was stronger for lower social support received from family and friends.

Social support was linked to improved quality of life in COPD patients (Arne, et al., 2011). Better health, based on self-rating and quality of life, was related to increased exercise performance, social support, and lack of financial worries. However, severity was not adjusted for in the analyses. In addition, cause and effect cannot be established due to the cross-sectional design of the study.

2.6.2 Conclusion

Research so far supports the importance of social capital in health status and health behaviours such as smoking and participation in pulmonary rehabilitation. Specific elements of social capital have been associated with better health, mainly higher interpersonal trust, reciprocity and social participation. Some of these components exert their influence indirectly through psychosocial mediators for example self-efficacy. This increases the complexity of the pathways in which social capital and its components are associated with health. The relationship between social capital and socio-economic variables suggests that these interrelationships may be more intricate than previously thought.

2.7 Additional factors to consider when examining health care access and quality of life in COPD

The most common pathways through which SES can exert an impact on the availability and accessibility of health care services as well as on people's well-being and quality of life in COPD have been discussed in previous sections. The focus of these pathways has been mainly on wider socio-economic variables associated with HCA and QoL in COPD such as deprivation in terms of income, education and occupation and neighbourhood SES. However, there are further factors which could more directly influence the way people seek health care and adjust and cope with their condition that

are more specific to the individuals themselves and their immediate surroundings. These will be described in the following sections.

2.7.1 Self-management in COPD

Self-management programmes aim to actively involve patients in their treatment process by providing them with the knowledge and skills to cope effectively with various aspects of their disease management such as medication adherence, monitoring their condition such as identifying early signs of exacerbation of COPD and responding accordingly to prevent deterioration and progression as well as making changes to health behaviours (Worth & Dhein, 2004).

In COPD, exacerbations can be reduced by medication such as long-acting bronchodilators combined with anti-inflammatory drugs. Inhaled corticosteroids were associated with a reduction in rate of 25% compared to placebo in patients with moderate to severe COPD (Burge, et al., 2000). Hopes that admissions could be reduced by drug intervention have not been so clearly realised (Wilkinson, Donaldson, Hurst, Seemungal, & Wedzicha, 2004). These findings suggested that pharmacological treatment contributes to the reduction of exacerbations and hospital admissions in COPD. While medication has a significant impact on patients' health status, there has not been much evidence of an effect in admission rates. Self-management plays an important role in COPD and can supplement and enhance the effects of pharmacological treatment.

Patient education and self-management programmes have been associated with improvement in patients' quality of life, lower morbidity rates and reduced health care costs in various chronic diseases such as asthma, diabetes and heart failure (Gibson, et al., 2002; Gazmararian, Williams, Peel, & Baker, 2003). In COPD, the evidence is not as consistent as in other chronic illnesses (Bourbeau, et al., 2003; Rice, et al., 2010). Monninkhof, et al.'s (2003) review of eight studies comparing self-management education with routine care found no effect on hospitalisation rates, accident and emergency visits, days lost from work, and lung function. Findings regarding health-related quality of life showed a positive trend but did not reach statistical or clinical significance. The authors attributed these findings to variability in the measurement and use of COPD-specific instruments. The review did highlight that the need for rescue medication was reduced in the intervention groups possibly indicating an association

between self-management education and improved disease control in COPD patients. Findings that half of the exacerbations in patients with COPD were not reported to a doctor led to the hypothesis that more educated patients were more likely to have increased oral steroid and/or antibiotic intake for their symptoms thus decreasing the likelihood of GP or A&E visits (Seemungal, et al., 1998). Insufficient data and heterogeneity in the definition and measurement of outcome measures used in the studies included in their review prevented Monninkof et al. (2003) from making recommendations for self-management programmes in COPD. In contrast, an updated Cochrane review by Effing, et al. (2007) showed that self-management education was associated with a decrease in hospital admissions justifying a generic recommendation of self-management education in COPD. However, results did not show positive effects regarding GP and nurse visits, symptoms, use of steroids and/or antibiotics and rescue medication, exacerbation rates, A&E visits, lung function, exercise performance, and days lost from work associated with self-management. Effing et al. (2009) were also unable to provide clear recommendations on the type and components of self-management education programmes in COPD due to significant heterogeneity in the design and content of the interventions, study populations, follow-up time, and outcome measures of the reviewed studies.

It appears from the evidence that self-management programmes could be recommended as a way to enhance the effects of medication in patients with COPD. Certain components and specific content of self-management education might provide more positive effects. Self-management education for COPD patients may require a more patient-tailored approach in terms of treatment, patient education and self-management due to the characteristics of the disease and associated factors such as higher number of co-morbidities, patients' age and complexity of treatment regimen. Additional factors should be considered such as adherence to self-management programmes. Studies reported adherence rates between 40-42% in self-management education components in COPD patients (Bischoff, et al., 2011; Bucknall, et al., 2012). The patients who adhered to the intervention did show improved outcomes. These findings suggested that targeting patient characteristics such as self-efficacy might contribute to increasing adherence rates to self-management programmes. Self-efficacy refers to the patients' belief in their ability to achieve desired goals (for a detailed discussion of self-efficacy see Chapter 3). Having information about the disease is one half of the story. The other half is patients' perceptions of their skills and ability to integrate this knowledge and the demands of the disease into their daily life (Bourbeau, Nault, & Dang-Tan, 2004). Self-efficacy or the perception of having the

skills to perform a desired behaviour is associated with health-related behaviour changes (Bandura, 1978). Self-efficacy has been found in many COPD studies to influence specific health behaviours (Scherer & Schmieder, 1997; Atkins, Kaplan, Timms, Reinsch, & Lofback, 1984b; Gormley, Carrieri-Kohlman, Douglas, & Stulbarg, 1993; Kaplan, Ries, Prewitt, & Eakin, 1994). Thus, an intervention aiming to increase self-management in COPD should ideally include components to increase patients' efficacy beliefs and confidence in outcomes in addition to patients' knowledge about COPD.

Last but not least, such as health-related education, cognitions and beliefs have to be considered when designing self-management interventions. According to the World Health Organization (1998) health education was defined as "comprising of consciously constructed opportunities for learning involving some form of communication designed to improve health literacy, including improving knowledge, and developing life skills which are conducive to individual and community health." (WHO, 1998). Some patients might naturally be better self-managers than others and this might increase their benefits. For example, a study by Fan, et al. (2012) suggested that patients may not always comprehend what they are being asked to do. Patients with COPD are called to identify and self-manage complicated and variable events that could also be related to co-morbidities and a number of different diagnoses such as pneumonia, heart failure, and pulmonary embolism. The ability to self-manage more effectively which includes self-efficacy has been linked to health literacy. Health literacy refers to having the knowledge and skills to understand and act upon health information, communicate one's history effectively to the health care professionals and follow their recommendations. Health literacy also encompasses additional aspects of health care such as understanding how to access medical services, make appointments, complete and sign consent and insurance forms and being aware of medication and medical procedures costs as well as sources of payment (Sadeghi, Brooks, Stagg-Peterson, & Goldstein, 2013). Population groups that are at greater disadvantage for lower health literacy include immigrants, unemployed and elderly people (Wilson, Racine, Tekieli, & Williams, 2003) especially those who suffer from chronic illnesses such as asthma (Davidsona, Liub, & Sheikhc, 2010; Mancuso & Rincon, 2006), COPD (Partridge, Karlsson, & Small, 2009) and diabetes (Reid, et al., 1995). People with chronic illnesses and low health literacy have limited information and education about their illness, poorer health status and symptom management in comparison to people who have sufficient disease-related education (Gazmararian, et al., 2003). The following

section provides a more detailed discussion of health literacy and its importance in chronic illness self-management.

2.7.2 Health literacy in COPD

Health literacy or patient education is one of the factors that can influence the degree and effectiveness of self-management in COPD. Health literacy is defined by the World Health Organization (WHO) as ‘‘the cognitive and social skills that determine the motivation and ability of individuals to gain access to understand and use information in ways which promote and maintain good health” and “Health literacy means more than being able to read pamphlets and successfully make appointments. By improving people’s access to health information and their capacity to use it effectively, health literacy is critical to empowerment’’ (Nutbeam, 1998). Thus, health literacy could be considered as one of the pre-requisites for successful patient education and optimal disease and medication management. Health literacy is not only personal but also social in nature. It is important for effective communication between the health care professional and the patient with COPD. One of the challenges specifically in COPD is that disease management is not straightforward due to the presence of multiple co-morbidities and complex treatment regimens in the majority of patients (Crisafulli et al., 2008).

Pulmonary rehabilitation is one of the treatment options available to COPD patients. It involves provision of supervised exercise training, self-management education and psychological support (Hill et al., 2010). Effective communication between health care professionals (HCPs) and patients is central to all three components of pulmonary rehabilitation. Patients’ capacity to understand complex verbal or written information is related to the degree of knowledge of their underlying disease. Lower health literacy is associated with less effective symptom management and poorer health status in comparison to patients with higher health literacy levels (Berkman, Sheridan, Donahue, Halpern, & Crotty, 2011). Patients may not understand what is wrong and how it can be addressed and they may also be too embarrassed to admit this lack of understanding. However, health care professionals are equally unaware of the importance of health literacy in their communication with patients (Baker, et al., 2004). This was evident in Sadeghi, Brooks, & Goldstein’s (2013) study who interviewed COPD patients and health care professionals at a Pulmonary Rehabilitation Centre about their views on

health literacy in health care communication. Findings indicated that the majority of patients were not aware of what constituted health literacy but did acknowledge the importance of knowledge in relation to their quality of life which was a view also shared by health care professionals. Patients reported that time constraints and use of medical terminology were barriers to effective communication with their health care professional. For health care professionals, barriers included patient characteristics such as language, culture and awareness of the availability and purpose of health care services. A variety of sources such as family and peer support, informational resources and trust and empathy between patient and health care professional were reported as being beneficial in improving patient-health care professional communication (Sadeghi, Brooks, & Goldstein, 2013).

Successful self-administration of medication was a further treatment component of COPD care that was associated with patient education as shown in a study of 191 COPD patients across 7 outpatient clinics (Bourbeau, et al., 2003). Patients who had received the education self-management intervention were less likely to have been hospitalised, to have visited A&E and to have consulted their GPs compared to patients who had not received the intervention (Bourbeau, et al., 2003). Insufficient health literacy skills have been associated with higher hospital admission and mortality rates and poor disease control (DeWalt, Berkman, Sheridan, Lohr, & Pignone, 2004; Sudore, et al., 2006; Wolf, Gazmararian, & Baker, 2005). Health literacy in COPD refers not only to self-management skills but also to the ability to utilise health care services in the most beneficial way for one's quality of life and prevention of exacerbations (Kiser, Jonas, Warner, Scanlon, Bryant Shilliday & DeWalt, 2012). Health literacy in COPD is especially important given the particular characteristics of the disease. For example, the pharmacological regimen for patient includes a number of inhalers each of which may require a very different inhalation technique. Inhaler technique is crucial because it can support or prevent the delivery of the inhaled medication to the lungs which is necessary for successful management of the disease. Low health literacy in patients with asthma has been associated with worse inhaler technique compared to patients with sufficient literacy (Paasche-Orlow et al., 2005; Williams, Baker, Honig, Lee, & Nowlan, 1998). Self-management programmes that also addressed inhaler technique in their education content were associated with improved health care use, quality of life and rescue medication use (Blackstock & Webster, 2007; Lemmens, Nieboer, & Huijsman, 2009; Peytremann-Bridevaux, Staeger, Bridevaux, Ghali, & Burnand, 2008). Similarly, Kiser et al. (2012) evaluated the effect of a self-management educational intervention compared to routine care in lower and higher health-literacy patients with

COPD. The intervention addressed inhaler technique, smoking cessation, and the use of a COPD action plan. Findings indicated that a self-management intervention tailored to patient literacy needs was associated with improvements in inhaler technique for both patient groups.

In view of the evidence, it has been suggested that self-management programmes for COPD are beneficial but should be patient-centred and tailored to the needs of individual patients based on their disease and personal characteristics, taking into consideration the patients' capacity of understanding their exacerbation symptoms and incorporate skills and self-health behaviours (Bourbeau, et al., 2004; Wedzicha & Vestbo, 2012). So far, the discussion of the evidence regarding factors influencing health care access and utilisation of services in COPD has been limited to patient- and health care professional-specific factors. The third variable to be discussed in order to acquire a better understanding of the situation in COPD refers to structural factors and is provided below.

2.7.3 Structural factors in accessing health care services in COPD

In addition to factors relating to self-management including health literacy and support from health care professionals, there are also structural barriers that may hinder patients' access and use of health care services for their COPD. Structural factors refer to aspects relating to the organisation and supply of services that are essential for managing chronic and acute illness in primary and secondary care.

Previous research has indicated that patients with COPD reported a number of barriers in accessing their GP practice such as lack of transportation to the surgery, walking the distance from the car park to the surgery or going up the stairs to the doctor's office which placed additional demands on patients' physical limitations such as breathlessness, lack of continuity of care due to seeing a different GP every time, good relationship with practice staff including delays in telephone requests for prescriptions and receiving response from a practice answerphone, provision of regular routine appointments and the option for home visits (Shipman, White, Gysels, & White, 2009). Patients' mobility difficulties had been cited in previous studies as being an important barrier in COPD patients having less contact with their GPs which showed a steady decrease over time (Elkington, White, Addington-Hall, Higgs, & Edmonds, 2005).

With regard to the primary care setting, the quality of GP practice services available to their patients is another structural factor that needs to be taken into consideration. For example, McLean, Sutton, & Guthrie (2006) did not find evidence of an improvement in treatment quality with the provision of incentive payments to GPs in the NHS GP contract (Quality and Outcomes Framework - QOF). However, for 17 of the 33 QOF indicators – for which payments were made – that were examined, they did observe that poorer quality of care was associated with higher deprivation. The difference in delivered quality provided by GP surgeries was smaller for the majority of simpler process measures, such as recording of smoking status or blood pressure measurement while for more complex process measures such as diagnostic procedures, for example, glycaemic control in diabetes and influenza immunisation, differences in quality were significantly greater.

Secondary and tertiary care settings contain similar barriers from an organisational and supply aspect for COPD services. Hospitalisation rates in COPD were associated with high mortality and extended lengths of stay (Roberts, et al., 2001). However, both of these variables varied significantly between hospitals (Roberts, et al., 2002). These differences were partly due to patient-related factors such as health care seeking patterns of effective self-management (Price, et al., 2006) and partly due to hospital-specific factors such as availability of resources.

Price et al. (2006) found a strong correlation between the number of of specialists per hospital bed and per patient outcome such as decreased mortality rates. This relationship followed a linear trend with increasing number of specialists associated with better outcomes. Both the numbers of specialists and organisational component such as the availability of local management guidelines, higher number of beds and a composite organisational score derived from good medical practice were associated with shorter hospital stays. The authors emphasized that this might be an issue of organisation relating to the whole system of health care and resource availability affecting quality of patient care rather than any individual component such as specialist numbers. Price et al. (2006) also highlighted that their findings did not show that any of the organisational or resource factors could account for the variation in readmission rates. They suggested that this variation in readmissions could be attributed to the degree of disease severity before admission or a lack of effective ways of coping employed by acutely breathless COPD patients. Price et al. emphasised the need for patient empowerment and their ability to effectively self-manage their exacerbation using rescue medication and access to health care services at home as possible

alternative strategies which would, however, still need validation. While Price et al.'s (2006) evidence is indicative of a good effect, it cannot provide information for causal effects without data from a trial setting.

Considerable variation between units of organisation and resources in the quality of secondary care provision which could affect patient care was also reported by George, et al. (2011) based on data from the 2008 COPD Audit. Despite significant improvement in resources, organization and delivery of acute COPD care across the UK with greater accessibility to COPD-specific services as well as a slight decrease in mortality and length of hospitalisation, considerable variation between units remained. For instance, while utilisation and availability of pulmonary rehabilitation programmes was increased from 64% in 2003 to 90% in 2008, only 59% of units were able to provide access to all eligible patients – based on NICE guidelines – and other units offered limited availability of the programme.

Hospitals with greater resources were found more likely to achieve better outcomes (Roberts, Barnes, Lowe, & Pearson, 2003). Hospital size also seemed to be inversely related to the availability of services such as pulmonary rehabilitation programmes, non-invasive ventilation (NIV) and invasive ventilatory support, specialist respiratory wards, speciality triage or early discharge scheme (Hosker, Anstey, Lowe, Pearson, & Roberts, 2007). Despite great variation in all elements of acute hospital care for COPD patients in the UK, findings indicate that smaller hospitals offer the fewest services and those hospitals that can offer specialist services are more likely to have better patient outcomes and be offered interventions of proven effect.

However, availability of resources must be proportionate to demand. Landry, Hamdan, Al Mazeedi, & Brooks (2008) stressed the fact that the demand for health care services is always increasing and despite allocating monetary and human resources to meet needs, there will rarely be sufficient resources available to allocate to all diseases and settings. The authors cited research findings which reported a significant increase in health services demand for COPD which exceeded health care supply and would in theory lead to a problem in accessing services for COPD (Cao, Ong, Eng, Tan, & Ng, 2006; Crockett & Price, 2007; Han, et al., 2007; Ninot, et al., 2006; Varkey, 2004; Wilkinson & Wedzicha, 2006; Wilson, 2006). Landry et al. (2008) proposed that the availability of rehabilitation services for COPD patients could act as a mediating factor to balance health service demand involving more expensive and resource-intensive health services on a long-term basis. However, despite its benefits for COPD patients,

there is great difference between demand and supply of pulmonary rehabilitation programmes for people with COPD with only 2.8% of Canadians receiving these services and the average wait time for inpatient rehabilitation services reaching 6 days (Canadian Institute for Health Information [CIHI], 2005). Data from North America, Europe, and Japan provided similar results with availability of pulmonary rehabilitation at only 56% of hospitals (Kida, et al., 1998) supporting the finding that services for respiratory conditions are only available for a minority of patients (Brooks, Lacasse, & Goldstein, 1999; Brooks, et al., 2007). Data from the UK COPD Audit from 2008 (National COPD Audit, 2008) on the availability of pulmonary rehabilitation programmes described above are in line with these findings.

2.7.4 Conclusion

Evidence has been discussed highlighting the complexity of the role of socio-economic status in the health care access and quality of life in patients with COPD. There is more than one pathway through which SES can influence access to health services. The first is the “societal” pathway. It refers to the lack of or limited availability of resources such as primary and secondary health care services and great variability in the quality of care provided within them. This pathway reflects the societal or public aspects of accessing services. The second is the “personal” pathway. This pathway refers to the availability of the patient’s own resources that can influence their access to health services. Health literacy and self-management skills are two of the more personalised factors described so far that can influence whether, how and when patients access services they need. Lack of education and knowledge as to the meaning and urgency of experienced symptoms as well as of the existence and ways of utilising available services can be as great a barrier as the non-existence of services. Similarly, for quality of life in COPD, both pathways – the “societal” and the “personal” can influence a patient’s well-being. Findings from the literature do consistently show that access to health care services and quality of life in COPD cannot be accounted for by one category of factors such as SES or availability of health care services. There is another side to the story which involves the personal attributes and cognitions of the patient. These involve a variety of concepts such as the ways patients think about their illness and attempt to make sense of it as well as their perceptions of their ability to achieve desired outcomes such as increasing control over their condition. Understanding how SES is associated with HCA and QoL in COPD and improving these outcomes would require addressing a combination of patient- and health care professional-related characteristics as well as associated structural factors. On the one hand, patients need

to learn skills such as knowing how to use resources and manage their relationship with health care professionals as well as problem solving, decision making, identifying early exacerbations signs and taking action and following a predefined action plan (Bourbeau & Van Der Palen, 2009). The availability and use of these skills will enhance patients' self-efficacy which needs to be supported by regular follow-ups – provided by health care professionals – leading to improved disease control and patient outcomes. The need for health care professionals to be proactive and reactive in their relationship with the patient is highlighted in research findings. Health care professionals need to be able to identify potential barriers that may prevent patients' access and use of health services to their benefit and support their patients in overcoming these obstacles. They must also address structural factors that may hinder effective management of their patients' condition. The role of further individual-level factors such as illness perceptions and self-efficacy and how they may be affecting HCA and QoL in COPD will be described in detail in Chapter Three.

2.8 Overall conclusion

There is evidence for the existence of an association between low SES and low HCA especially in COPD. Contradictory findings have also been described emphasizing the variability in the operationalisation and measurement of SES and HCA. Higher deprivation was also consistently associated with poorer QoL particularly in COPD. This, however, cannot be attributed to inequality in the access to health care services. The fact that higher deprivation is usually associated with poorer QoL and more severe disease highlights the need to adjust for severity when examining the relationship between SES and QoL in order to eliminate confounding effects and treatment variables. The question emerges as to the true nature of the relationship between SES and HCA and QoL in COPD and additional factors that could be involved in these associations since SES cannot fully account for this link. Therefore, the aim of the current study was two-fold. First of all, it was to examine whether lower SES was related to more impaired HCA and poorer QoL in COPD. Secondly, it was to investigate whether additional psychosocial factors such as social capital, illness perceptions and self-efficacy mediated the relationship between lower SES and lower HCA and between lower SES and poorer QoL. The role of illness perceptions and self-efficacy in HCA and QoL in COPD will be discussed in the following chapter.

Chapter 3

Literature Review II: Psychosocial factors in chronic illness and COPD

3.1 Psychosocial variables associated with SES, HCA and QOL in COPD

A detailed description of the role of SES in relation to health care access and quality of life in a range of diseases and particularly in COPD was provided in Chapter Two. Socio-economic deprivation cannot account fully for limited healthcare access and poor health outcomes despite the fact that SES can influence people's beliefs about disease and disease prevention (Saint-Germain & Longman, 1993). Access to medical care on its own does not provide a sufficient explanation for the association between SES and health either (Adler, Boyce, Chesney, Folkman, & Syme, 1993). As described in Chapter Two, accessing health care services entails two aspects: (a) the availability and provision of these services and (b) utilisation of these services by patients. If it is hypothesized that these services are freely available to people, then factors that might influence health care utilisation should be considered. Socio-economic factors could pose a barrier in accessing free health care services due to additional costs involved such as transportation. However, as stated above socio-economic factors cannot fully account for limited access to health care services. Therefore, it is important to take into account people's individual characteristics, for example, how they make sense of their illness and what it means to them or whether they feel sufficiently confident to seek medical care, communicate effectively with health care professionals and follow treatment (Sensky, MacLeod, & Rigby, 1996; Leslie, Urie, Hooper, & Morrison, 2000; Gecas & Schwalbe, 1983). Both of these characteristics can influence the way patients cope with their condition and access and utilise services. Thus, psychological variables were included in this research study focusing specifically on illness perceptions and self-efficacy.

Socio-economic status can influence self-efficacy because it affects people's opportunities to take effective measures, especially at their work, and also because self-efficacy leads to people having different beliefs which define how they may evaluate the way people act. It can be hypothesised that the same might be true for the way patients make sense of their illness. Previous studies have established that higher

education and occupational status are associated with stronger self-efficacy and ability to master life events. Losing one's job, making less money and receiving less education were found to decrease a person's sense of self-efficacy (Duncan & Morgan, 1980).

To sum up, there appears to be a link between SES and HCA and SES and QoL as well as evidence for the likelihood of a relationship between SES and illness perceptions and SES and self-efficacy. Therefore, it could be hypothesised that SES may influence the way patients with COPD perceive and make sense of their illness as well as their level of self-efficacy. Patients' illness perceptions and self-efficacy may, in turn, have an impact on the way they utilise healthcare services and engage in health-related behaviours such as medication adherence or exercising. These links led to including illness perceptions and self-efficacy in this research and examining their role as possible mediators in the relationship between SES and HCA and SES and QoL in COPD. Findings would contribute to increasing our understanding of possible pathways between these variables and the nature of their associations. Chapter Three will present the background to what constitutes illness perceptions and self-efficacy, describe their origin and the research evidence that suggest a relationship between SES and health care access and quality of life in chronic illness and particularly in COPD.

3.2 Illness perceptions: origin and development

Illness perceptions arose when exploring factors that could positively influence healthy people's attitudes towards disease and increase the likelihood of preventing disease (Dabbs & Leventhal, 1966; Leventhal, Singer, & Jones, 1965). The common-sense model or CSM postulated that the individual is an active problem-solver who deals with both the perceived reality of a health danger and the emotional responses to this danger. This means that individuals engage in parallel processing on two levels: the cognitive and the emotional. The CSM model is based on three principles. First, the individual is actively trying to solve the health-threat problem by seeking relevant information and developing and testing hypotheses. These hypotheses involve attributions about the meaning of experienced symptoms and the person's health status and how they relate to information derived from the media and interpersonal relationships. Second, illness perceptions are a major cognition that influences coping

response and appraisal of behaviour outcomes. Third, illness perceptions are not always in agreement with medical facts but are highly individualised. The model also posits that memories of previous health and illness experiences lead to the formation of schemas which contribute to decoding illness perceptions triggered by internal and external stimuli. In the case of an internal stimulus, the similarities it bears to a schema developed based on a previous illness experience or an imagined disease such as cancer will influence its subsequent interpretation. These schemas are matched with five dimensions of illness perceptions involving identity, timeline, cause, controllability and consequences, discussed in detail below. A visual representation of this process is provided in Figure 3.1.

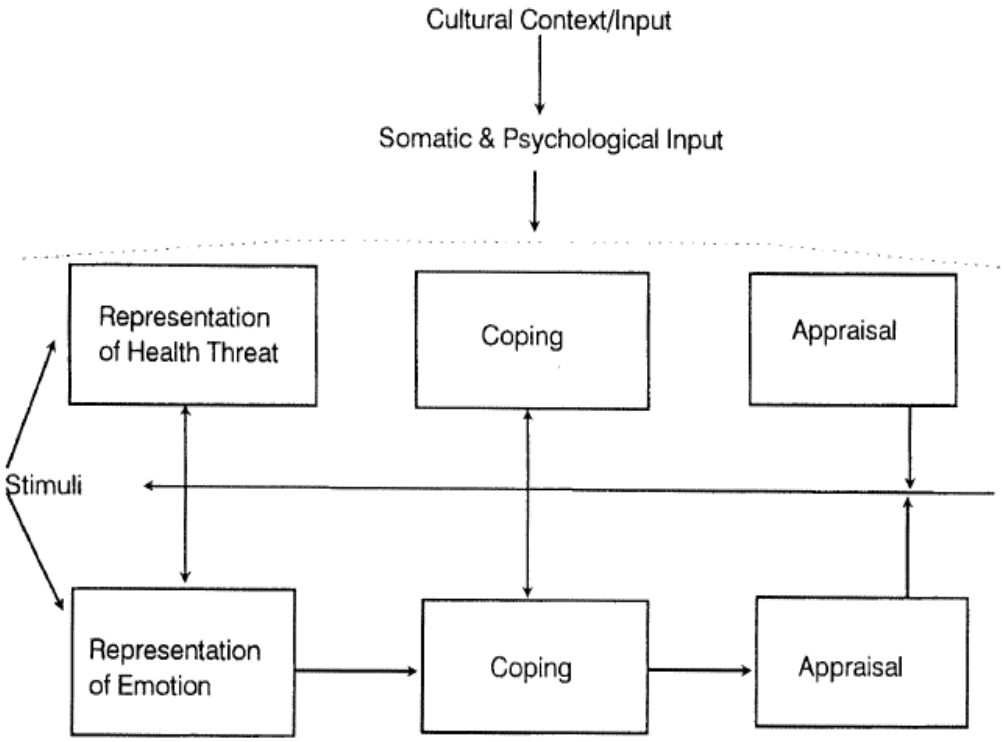


Figure 3.1 The common-sense model of illness representation (Diefenbach & Leventhal, 1996)

Diefenbach & Leventhal (1996) proposed that the development of illness perceptions follows a chain of events and actions which can be could be thought of as follows: a person watching a message on television regarding melanoma or associated symptoms such as a mole of unusual colour or shape might start suspecting that they may have melanoma. Depending on the person's emotional response to the fear of melanoma, the way they think about it might be influenced. The way people perceive a

health threat (fear) can trigger a series of actions: (a) they identify what needs to be done and take action to control the health threat; (b) they then appraise how effective these actions were in controlling the threat; and (c) they feed this appraisal back to the way they think about the threat and update their illness perceptions. According to Diefenbach & Leventhal (1996) an emotional response to a health threat could trigger a cognitive response which could lead to certain actions. The appraisal of the effectiveness of these actions in terms of controlling the threat would be fed back to the person's cognitions and emotions and they would be updated accordingly. Diefenbach & Leventhal (1996) proposed a similar pathway for a cognitive response triggered by a health threat that could ultimately influence an individual's emotional response and perceptions of illness.

3.2.1 How are illness perceptions formed and how do they function?

a. Two-level processing

Leventhal (1970) proposed a framework termed "the parallel response model" in an attempt to explain the two-level response described above i.e. the emotional and the cognitive response to a health threat. A person responds on two levels to health messages that involve fear: (a) the cognitive level and (b) the emotional level. These responses are suggested as being the result of two systems which process information: the objective-cognitive processing system and the subjective-emotional processing system. These two systems are separate and partially independent but function in parallel.

The theory postulates that the functions of these two systems are quite distinct. The objective-cognitive system can generate two actions. First, it can produce a representation of the disease danger. Secondly, based on that representation, it can produce a plan of action for a coping strategy for that danger. The representation would be derived from present and previous experiences. Present experiences would involve information received from the media, health professionals, and sensation of physical or emotional symptoms. According to Leventhal et al. (1983), previous experiences might include abstract memories about health information provided from family and friends or past experience of symptoms and associated treatment. Leventhal (1970) and Nerenz

& Leventhal (1983) also proposed that conceptual, concrete and emotional memories could be integrated with the perception of sensory and perceptual stimuli and increase a person's awareness of an illness threat

Miller & Galanter (1960) suggested that an individual can consider alternative options when, for example the coping strategy initially adopted was not effective in dealing with the health threat. According to Miller & Galanter (1960), this process could be performed through a rehearsal of possible options which would be weighted as to their benefits and costs. The individual would also consider how to achieve a specific goal. This process of developing illness representations and coping mechanisms might also be influenced by a person's cognitive skills such as perception, memory and thinking patterns.

Leventhal et al. (1983) proposed that the subjective-emotional system functions differently. Health threat messages can trigger a variety of emotional responses in people such as fear, depression or feelings of disgust and anger. Zajonc (1980) suggested that the source of these responses is a processing system which is sensitive to concrete perceptions and relatively independent of cognitive functions (i.e. thoughts) Thus, a pictorial representation of the consequences of a health threat such as having lung surgery would trigger fear more readily than a verbal message about cancer being fatal and avoidable. Leventhal et al. (1983) suggested that this was an indication that emotions and thoughts are not always consistent, proposing that different actions would be required to handle and control emotions compared to the ones used to cope with disease danger.

According to Leventhal et al. (1983) these two processing systems would be relatively independent but would tend to supplement, interfere with or mutually facilitate each other. For instance, people may feel afraid of having car accident but this does not mean that they will use their seatbelt or drive carefully. Chances are they will do either. Thus, the action would be relatively independent of the emotional sensation and would offer the possibility to generate two separate plans, each to control one level (i.e. the emotional and the cognitive). For example, when driving on a dangerous road, in order to control the car, caution would be needed in braking and steering. Leventhal et al. (1983) suggested that this could control the action or coping behaviour. Instead, to control the emotional response i.e. decrease the anxiety from driving on the dangerous road, one could think of having a cup of tea or relax when arriving at home.

The theory went on to state that interference between the two processing systems would occur when the reaction triggered by fear is not consistent with the action recommended by the health professional. For instance, the fear of getting a diagnosis of lung cancer would prevent a smoker from getting an X-ray. Instead, facilitation would occur if there was consistency between the reaction to fear and the action required to meet the objective.

Leventhal & Niles (1965) suggested that independence and interaction between the cognitive and emotional processes would be reflected in their different time patterns after interception of a fear message (Leventhal & Niles, 1965) The likelihood of the interaction effect to occur is greater when the levels of fear are higher. This is more likely to happen immediately after the fear warning because fear dissipates quickly. Rogers & Mewborn (1976) proposed that the cognitive representation of health danger has a longer duration and may vary as time elapses Thus, Rogers & Mewborn (1976) claimed that the effect of the cognitive system would be stronger in the long-term as in Leventhal's fear studies (1965) where the emotional response resulting from fear messages began to dissipate after 24 hours. In contrast, the cognitive representation of the health threat would last longer and would be a pre-requisite in combination with action plans for long-term behaviour change.

b. Parallel processing models

Observation of human behaviour led to the development of a number of dual-process theories (Chaiken & Trope, 1999; Epstein, 1994; Kahneman, 2003; Smith & DeCoster, 2000; Strack & Deutsch, 2004). These are called dual-processing theories because they classified mental processes that people employ to make social judgements and behaviour into two categories based on the mode of their operation: automatic or controlled. Smith and DeCoster (2000) emphasised that the most significant difference between these models was whether the process of their operation was simultaneous or mutually exclusive.

Models similar to Leventhal's CSM were proposed. Epstein (1994), for example, maintained that the two systems – the perceptual and the conceptual - followed a parallel mode of operation and could lead to different response patterns in an independent fashion. Conflicts might arise due to inconsistencies in the emotional and

the cognitive responses. However, these two systems may also engage in interaction so that the implicit processes on the emotional level could influence the cognitive level. This interaction would be asymmetric because the perceptual experience occurred beyond conscious awareness. Strack and Deutsch (2004) proposed the reflective-impulsive model (RIM) of social behaviour supporting the existence of two information processing systems that operated in parallel fashion and guided social behaviour. The two systems were termed the reflective system (RS) and the impulsive system (IS). Despite the two systems operating simultaneously, the IS exerted greater influence because it operated independently of resources. The operation of the RS, however, depended on sufficient cognitive capacity.

The way people perceive illness and engage in health behaviours was explored by Meyer, Leventhal, & Gutmann (1985) who asked hypertensive patients whether they could identify when their blood pressure was raised. 92% of them said they could on the basis of symptoms they were experiencing such as headache, tension, tachycardia and warm face. The same participants had been asked earlier whether they thought individuals could tell when they were hypertensive and 80% thought that they could not. This suggested that people perceived illness differently on the emotional level such as experiencing symptoms which influences medication uptake or on the cognitive level, for example, agreeing that hypertension is not associated with symptoms.

The individual attempts to match the physical experience to the cognitive process. The experience of somatic symptoms, for example, encourages attributing a disease label to them. Having a disease label promotes the experience of physical symptoms. Easterling & Leventhal (1989) found that perceived susceptibility to breast cancer was associated with increased reporting of worry and symptoms. Symptoms were not always specific to cancer. These findings indicated that both perception of vulnerability and experience of symptoms were required in order to lead to worrying about cancer. For instance, a woman who discovered a lump in her breast and has a family history of breast cancer, which increases her perceptions of vulnerability to the disease, would be more likely to seek immediate professional help in comparison to a woman who did not have a family history.

In addition, low mood was associated with increased reporting of symptoms (Salovey & Birnbaum, 1989) and symptom severity (Croyle & Sande, 1988). The symmetry hypothesis postulated that physical symptoms would trigger a search and attribution of meaning by everybody affected.

In conclusion, illness perceptions may function on many different levels and influence various aspects of the disease threat and preventative or treatment behaviour such as accessing health care services and engaging in healthy behaviours. The illness perception model suggests that affective and cognitive processes interact and can lead to reappraisal of the way the patients try to make sense of the illness and adjust their coping strategies accordingly. This reappraisal may lead to modification of the person's initial beliefs, their coping strategy or both depending on a variety of individual, cultural, psychological or social factors.

c. Illness perception dimensions

Reference has been made mainly to symptoms and labels of illness perceptions so far. Further dimensions to illness perceptions were identified in later studies. Penrod et al. (1980) reported the dimensions of severity, timeline and cause (Linz, Penrod, & Leventhal, 1981). With the aid of qualitative research, the dimensions identified included: (a) identity - referring to the label and symptoms attributed to a disease, for example eczema and rash or itchiness (Lau & Hartmann, 1983); (b) causes of the disorder, for example genetic susceptibility e.g. allergies; (c) consequences of the illness, for example how the illness will affect the physical, social, financial and psychological aspects of one's life; (d) timeline which refers to the perceived duration of the illness, its progression and whether it will be ongoing, temporary or cyclical in nature and (e) cure or control which is the degree of control a person feels they, the medications or the doctor have over the disease as to its treatment or progression (Lau & Hartman, 1983). Further components were added with the development of the revised illness perceptions questionnaire which is the one of the main measurement instruments used for illness perceptions and which was used in the current study. These additional dimensions included: (a) the division of control into treatment and personal, referring to the perceived control that medications and the patients themselves have over the illness; (b) the addition of cyclical timeline to describe the nature of symptom frequency (i.e. relapses or remissions); (c) the addition of illness coherence was developed to measure the degree to which a patient had a coherent understanding of their illness on the basis of his perceptions. It was thought of as the result of a process involving meta-cognition on the part of the patient in their attempt to evaluate how coherent or useful their perceptions were. This would influence the

degree of their understanding their illness; and (d) the addition of emotional representation referring to the emotional response to the health condition (Moss-Morris, et al., 2002).

These dimensions provided a framework which allowed researchers to better understand a person's behaviour when faced with a health threat and determine how the self-regulatory process occurs (Linz, Penrod, & Leventhal, 1981; Penrod, 1980). A significant discrepancy between the degree of self-reported illness-related dysfunction and the severity of the underlying pathology has been found which suggests that the way patients perceive their illness is not always dependent on their objective disease severity.

d. Do illness perception dimensions vary?

Leventhal et al. suggested that people's perceptions of illness may vary depending on the social and environmental conditions in which people live and grow as well as their experience of illness. Anthropologists proposed that cultural differences and beliefs could influence the way people perceived an illness and could lead to the identification of different perceptions to those already identified (Kleinman, 1980). Leventhal et al. maintained that different cultures would not necessarily lead to the formation of different illness perceptions but rather could influence the intensity of the illness perceptions in relation to cultural elements. The strength of these effects and the factors determining them were still to be explored. Leventhal et al. suggested categorising illness perceptions but Swartzman & Lees (1996) claimed that this categorization would depend on a population's experience of the illness as well as their understanding of it. For example, living in an area characterized by water-borne infectious diseases would encourage people to attribute the cause of a disease to this external factor. Having a family history of cancer would increase the likelihood of attributing the cause of a disease to internal factors such as genetic vulnerability. The way people perceive the consequences of a disease could be dependent on the stage people find themselves in life and the responsibilities they may have. Examples include physical status, social and financial impact which would vary depending on a person's age and personal and professional status. Age, for example, could influence people's illness perceptions by reducing their willingness to tolerate risks. Older people were

quicker in seeking health care (Cameron, Leventhal, & Leventhal, 1993) possibly due to their perceived increased vulnerability to illness because of their advanced age. Cameron et al. (1993) emphasised that these differentiations are important and might influence how people choose and maintain their preventive and treatment behaviours.

e. Illness perceptions: separate entities or clusters?

The CSM posits that illness perception dimensions do not function independently but as sets. There are different types of illness perception models depending on the nature of the illness. Leventhal et al. described three types: (a) one for acute illnesses such as the common cold; (b) one for diseases characterized by cyclical flare-ups such as allergies and (c) one for chronic illnesses such as cancer or arthritis. All models consist of the same dimensions but differ in their pattern which varies depending on the illness. The initial illness perception model is not always maintained and people can shift from one model to the other. For instance, Leventhal, Easterling, Coons, Luchterhand, & Love (1986) found that 29% of women suffering from metastatic breast cancer considered their illness to be acute and curable at the beginning of their chemotherapy treatment. 6 months later only 11% of these women maintained the same beliefs. The extent of the treatment duration did not only influence the dimension of timeline but other dimensions as well. For example, the ineffectiveness of chemotherapy in achieving cancer remission was associated with ineffectiveness of the treatment as well as perceptions of controllability and timeline. It appeared treatment was always assessed in relation to a number of criteria including duration of illness, elimination of symptoms, illness control and elimination of discomforting consequences. One dimension on its own is highly unlikely to be able to exert an effect on illness perceptions. Instead these dimensions are interlinked. Correlations between specific dimensions of illness perceptions suggest that there is an underlying systematic and logical pattern of association. For instance, disease identity and perception of illness control are always related to a timeline and these three dimensions are likely to be associated with a causal explanation (Leventhal et al., 2003). The correlation between identity, perceived control and timeline indicated that patients who perceived their condition to be characterized by many symptoms and would be expected to have a strong illness identity were also more likely to perceive their illness as uncontrollable, chronic and having a severe impact on their everyday life (Hagger & Orbell, 2003).

Leventhal et al. emphasized the influence of contextual factors on the perception of illness. These factors include individual-level elements such as a person's home, school or work setting and culture. They also include community-level components such as neighbourhood violence, and social elements such as social cohesion or social capital. These factors can be both mediators and moderators of self-regulation through integration with everyday behaviours and experiences (Raffaelli, Crockett, & Shen, 2005) or interaction with wider community factors such as highly deprived neighbourhoods (Aber, Jones, & Cohen, 2000; Maughan & Cicchetti, 2002). Moreover, these contextual factors possibly contribute to the development of illness perceptions from childhood and into adulthood (Maniar & Zaff, 2011). The situational context incorporates the social determinants of health which have been associated with a broad range of outcomes (Graham & Kelly, 2004; Krieger, 2001; Lynch & Smith, 2005); Graham, 2004) and were discussed in detail in Chapter Two.

Culture holds an important role in defining illness perceptions. Different words and expressions are used to differentiate between and categorise various health- and illness-related events. Specific illnesses will be subject to shared views of the people belonging to the same culture. The cultural context also provides interpersonal relationships which influence the development of perceptual schemas. Culture provides a social guide about specific behaviours and processes which contributes to illness management. It can influence the way illness threat is perceived as well as how people plan and engage in preventative and treatment behaviours.

Leventhal et al. claimed that contextual factors might be both determinants and mediators of perceptions, coping and evaluation of outcome. They suggested that contextual factors could be mediators but also exert independent effects on outcomes. Coping strategies refer to the behaviours and cognitive processes people adopt. Coping procedures could be influenced by the cause attributed to the threat (e.g. flu) which would decrease its threat level to the person and thus delay action (Leventhal, Leventhal, & Contrada, 1998). The strategies people choose to adopt are influenced by the way the problem is represented which is influenced by the way coping strategies are performed and appraised. Coping responses are influenced by the way illness is perceived. For example, the experience of different symptoms triggers different responses. When experiencing headaches, 93% of the people would take over-the-counter medication while only 12% would do so in the case of chest pain (Stoller & Forster, 1994). These differences contribute to the CSM model increasing its accuracy in identifying the way coping responses and illness perceptions are associated and

interact for specific symptoms. Other dimensions of the CSM such as timeline or treatment control and consequences can also affect coping responses (Horne, 1997). People assign a timeframe for the time of action and duration of a medication (e.g. aspirin takes 20 minutes to an hour to act and its effect is experienced for 6-8 hours after that). The selection of medications also depends on the cause of illness and the side effects, potency and effectiveness of the treatment. For example, chemotherapy in cancer treatment has a range of severe side effects which may be effective in controlling the progression of the cancer but may not be able to cure it. Thus, patients may not adhere to this treatment. Patients first try to achieve symmetry between their perceptions and coping responses. If there is inconsistency between them, considerable distress may arise. Therefore, the selection of medications can be influenced by a person's perceptions guided by the social environment such as the media regarding their appropriateness and effectiveness for specific ailments (Horne, 1997).

f. Can illness perceptions influence coping strategies?

Coping strategies used to manage a condition are described by "if-then" rules postulated by the CSM. The "if-then" rule entails two parts: the "if" part refers to the nature of the illness threat, its perceived cause, identity, consequences and timeline. For example, "if this headache doesn't ease, I will take an aspirin". All of these components determine the appropriateness and set the outcome expectancies for specific behaviours. The "then" part refers to the actual behaviour that follows as a result of the problem in question. For instance, "If the aspiring doesn't ease my headache, I will go to my GP". Then, the person appraises the consequences of the coping response which might change the way the health threat is perceived. For example, a wound that is not improving despite applying the prescribed ointment might indicate that it could be a potential cancer rather than a sore. A stomachache which is not improving despite anti-acid medication becomes a possible ulcer. This leads to a second set of "if-then" rules which refer to the coping response, its appraisal and transformation of the illness representation (Leventhal et al., 1998).

Coping responses can overlap with illness perceptions (Horne, 1997). For example, while exercise is considered as a health enhancing behaviour, it could be perceived as

dangerous for patients recovering from coronary heart disease due to the strain placed on the patient's cardiovascular system. This overlap may increase specificity of "if-then" rules depending on the domain, for example "These headaches are due to stress so only relaxation will help". Health care access can be considered a form of coping strategy because it can follow from the "if-then" rule. For example if a person who has a headache, takes an aspirin but the headache does not stop, they might think that it could something more serious such as meningitis and would be more likely to cope more actively and so visit their GP.

g. How might illness perceptions influence the experience of HCA?

Illness perceptions can provide insight into symptom perception and help-seeking. The way people seek help for a health threat follows a chain of processes involving perception, interpretation and appraisal of symptoms. This is followed by consideration of ways of coping as well as perceptions of self-efficacy and motivation to put this into action (Scott & Walter, 2010). Experiencing symptoms alone does not mean that they will be interpreted in a way that would motivate people to visit their doctor (Komaroff 2001). Even if they were interpreted as a threat, this would not necessarily mean that the individual would seek help. For instance, significant delay was observed between the first experience of acute myocardial infarction symptoms and treatment-seeking in older and younger people (Maynard, Every, Litwin, Martin, & Weaver, 1995; McKinley, Moser, & Dracup, 2000; Yarzebski, Goldberg, Gore, & Alpert, 1994). Older people took considerable longer to seek treatment than younger people. Four categories of factors were identified which were found to influence response time in older people: (a) attribution of symptoms to aging, (b) severity and duration of symptoms, (c) attribution of symptoms to co-morbid and chronic conditions, and (d) previous cardiovascular experience (Ryan & Zerwic, 2003). However, other studies did not find evidence for this delay (Conigliaro et al., 2002; Ruston, Clayton, & Calnan, 1998) possibly because older people were better at dealing with health threats compared to their younger counterparts due to their efforts to conserve energy (Cameron et al., 1993). Older cohorts responded quicker than younger cohorts for all degrees of perceived severity of disease and independent of the number of problem-related symptoms or the degree of pain experienced. This suggested that the response time differences between younger

and older people were indicative of differences in the individual procedures used to manage a health threat (Cameron et al., 1993).

Delay in accessing health care has significant implications such as disease progression and deteriorating of quality of life (Allgar et al., 2006; Neal & Allgar, 2005). A variety of factors such as personal characteristics, the nature of the health care system and health professionals' attitudes can predispose, encourage and motivate people to adopt health-related behaviours (Aday & Andersen, 1974; Dutton, 1986). Some of the factors relate to patients' socio-economic status, age and sex. Health care level factors include access to and availability of health care services, financial factors and previous experience with services and health care professionals. Psychological and cognitive factors such as perceived vulnerability or self-efficacy as well as anxiety, beliefs and attitudes and expected outcomes can also influence health-seeking behaviour. Illness perceptions play a significant role in explaining how and when a patient would seek medical care. Illness perceptions address the elements of these different processes, for example, assessment of severity, decision regarding responses and evaluation of these options. Illness perceptions were strongly associated with later use of primary healthcare services (Frostholm, et al., 2005). Patients who associated more symptoms with their illness, and had longer timeline and more severe illness consequence beliefs showed increased healthcare utilisation in the 3 years of the duration of the study and also at 2-year follow-up (Frostholm, et al., 2005). Identity, timeline and consequences may be critical in predicting future health care utilisation in primary care patients.

Jackson & Kroenke (2006) investigated predictors of healthcare use in patients with medically unexplained symptoms attending outpatient neurology, cardiology and gastroenterology clinics. The number of symptoms associated with their condition or illness identity was a predictor of patients' health care use in the following 6 months. Such findings emphasised the importance of patients' illness perceptions and emotional responses to their symptoms and illness in relation to health care utilisation.

h. How might illness perceptions influence the experience of QoL?

Illness perceptions can provide insight into the relationship between coping and quality of life. Measuring quality of life is one method of assessing a patient's personal and social context (Bowling, 1995). The use of quality of life measures transfers the focus

of assessment from the illness to the patient (Higginson & Carr, 2001). Assessment of quality of life relies on patients' self-report and perceptions of their status which follow complex cognitive processes (McColl, Meadows, & Barofsky, 2003). Quality of life is dependent on individual perception and differs significantly in terms of importance and its definition. What is more, components of quality of life change over time depending on changing circumstances (Joyce, McGee, & O'Boyle, 1999). For instance, a phenomenon known as response shift (Sprangers & Schwartz, 1999) commonly occurs in patients with chronic illness (see Chapter Two). Illness perceptions emerge from the ways people conceptualise and think of illness. They could overlap with patients' perception of their quality of life and lead to measurement errors in both. When measuring quality of life we are assessing patients' perceptions of it. Illness perceptions, when assessed in combination with disease outcome, could provide insight how these two are related to each other (Fayers, 2007; Schwartz, 1999). However, illness severity can be objectively measured with the use of physical or disease markers such as lung function performance in COPD in terms of FEV_1% predicted. There is significant difference between subjective and objective measures. For example, COPD patients underestimated their morbidity. The discrepancy between patients' perception of disease severity and the actual grade of severity – assessed by an objective breathlessness scale – was significant (Rennard, et al., 2002). Another example of the way COPD patients perceive symptoms, regardless of disease severity, is reflected in the frequency and duration of exacerbations. Patients' perceived frequency of exacerbation of COPD was higher (Haughney, et al., 2005) than the frequency found in clinical trials (Herland, Akselsen, Skjønsberg, & Bjermer, 2005). This could suggest either that the trial sample was not representative or that patients had a different understanding of what constituted an exacerbation as compared to doctors' perceptions. These inconsistencies between patients' and doctors' perceptions were also observed in the duration of exacerbations. Patients perceived the exacerbations to last longer than recorded recovery time (Miravitlles, et al., 2003; Seemungal, Donaldson, Bhowmik, Jeffries, & Wedzicha, 2000; Haughney et al., 2005). Calverley, et al. (2005) concluded that the relationship between patient-perceived exacerbations as assessed by changes in individual symptoms and physician–perceived, event-based exacerbation was weak. This suggested that the way patients perceive their illness is not always indicative of the severity of the illness. However, these perceptions are important because they influence the way patients think and act within the illness. This could affect their patterns in accessing health care services and their quality of life. For example, patients with COPD might perceive their illness to be

severe because they experience significant breathlessness despite having mild COPD. In order to cope with their dyspnoea, they might increase their visits to their GP who might prescribe them more medication. More prescriptions might lead the person to believe their COPD is deteriorating and thus their perceptions of their illness would become more negative. Alternatively or simultaneously, they might engage in less physical activity because of fear of getting breathless and collapsing. Less exercise, in turn, would possibly lead to higher levels of dyspnoea which would reinforce patients' already negative perceptions of their dyspnoea.

3.2.2 Social cognition models: can they successfully predict health behaviours?

There are a number of psychosocial theories that address determinants of behaviour and aim to predict, explain and change health behaviours. They are embedded in social cognition models which are the most commonly used models in health behaviour research. Social cognition models provide theories that specify cognitive and affective elements, for example, beliefs and attitudes as determinants of behaviour. These models postulate that behaviour is influenced by a number of other factors such as the social or cultural environment or personal characteristics. They also posit that the effects of these factors are mediated to a great degree by elements proposed by their models. These elements are modifiable, for example provision of information and can be adopted as a framework for developing health behaviour interventions. These models help explain how and why people might act in a certain way within the health context. For example, the CSM attempts to explain health-related behaviour such as treatment adherence in chronic illness (Leventhal, Diefenbach, & Leventhal, 1992) which is considered as one of a number of procedures that patients can choose in order to 'cope' with their illness. According to the CSM, the patient is an 'active problem solver' whose coping behaviour, for example, following the doctor's treatment recommendation or not, represents a 'common sense' response to the way they interpret their experience on a cognitive and emotional level, for instance their symptoms or diagnosis. Depending on the patients' perceptions of the effectiveness of the treatment, they might choose to continue it or not. This process of evaluation and coping response feed backs into the way patients conceptualise their illness. Illness perceptions have been used to examine quality of life, hospital admissions, and medication adherence in COPD patients and participation in pulmonary rehabilitation

(Fischer, et al., 2007; Scharloo, et al., 1998; Scharloo, Kaptein, Weinman, Willems, & Rooijmans, 2000; Scharloo, et al., 2007).

Other social cognition models used in health behaviour research include: (a) the health belief model (HBM) (Becker, 1974); (b) the protection motivation theory (PMT) (Rogers, 1983); (c) self-efficacy theory (Bandura, 1986; Leventhal, Brissette, & Leventhal); (d) the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980); (e) the theory of planned behaviour (TPB) (Ajzen, 1991) and (f) the transtheoretical model (TTM) (Prochaska & DiClemente, 1992).

Taylor et al. (2006) concluded that these models could successfully predict significant variance in behavioural intentions in adults. These models have been applied to different areas of research (Taylor et al., 2006). The HBM for example, was most frequently used in health service utilisation such as medication adherence or immunization. The TRA and TPB, on the other hand, were more commonly used in almost all health behaviours such as exercise promotion and dietary change and HIV prevention. The behaviour-intention gap is a limitation of most health theories and shows significant variations. For example, McEachan, Conner, Taylor, & Lawton's (2011) meta-analysis suggested that the temporal distance between measuring the intention and observing the behaviour could be moderating this relationship. The occurrence of various circumstances or events could influence and possibly transform people's behavioural, normative or control beliefs and also change their attitudes, subjective norms or their perception of control leading to modified intentions. This would lead to a decrease of the predictive validity of intentions measured prior to the occurrence of these modifications (Conner, Sheeran, Norman, & Armitage, 2000; Sheeran & Orbell, 1999). Nevertheless, shorter delays are also poor predictors of the intention-behaviour process (Kor & Mullan, 2011). This suggested that another component might be implicated – self-regulation – which refers to having actual control over actions. In comparison to the TRA and the TPB, the ability of the CSM to predict health-related behaviour, for example coping strategies and perceived health in breast cancer patients was significantly higher. Two of the illness perceptions – identity and consequences – explained 57% of variance in physical health, while emotional illness representation and treatment control explained 47% of variance in mental health when adjusting for confounding variables (Rozema, Völlink, & Lechner, 2008). Similarly, in Hagger and Orbell's (2003) meta-analysis, a significant amount of the variance in coping could be explained by timeline and cure/control (27.7%) and cure/control and consequences (27.4%) across a number of studies.

Godin & Kok (1996) found strong correlations between people's intentions to attend screening and their attitudes, a weaker correlation with subjective norms and PBC across eight studies. When reviewing six additional studies, the authors observed moderate correlations between intention and behaviour and between PBC and behaviour. These findings are consistent with other meta-analyses of the TPB involving a range of behaviours and a greater number of studies (Armitage & Conner, 2001). More studies examining the TPB found that intentions and perceived behavioural control (PBC) explained 27% of the variance in behaviour and that other variables such as attitudes, subjective norms and PBC explained 39% of the variance in intention. The component of perceived behavioural control (PBC) contributed significantly to explaining a considerable proportion of the variance between intention and behaviour (Armitage & Conner, 2001). Furthermore, the amount of variance explained by the TRB increased by 11% when objective behaviour rather than subjective behaviour was examined.

When compared to other models of health-related behaviour, such as Protection Motivation Theory (PMT) and the Health Belief Model (HBM), intentions and behaviour accounted for significantly smaller proportion of the variance (Conner & Norman, 2005). One criticism of the TPB was that the social context is not taken into account when examining attitudes (Eagly & Chaiken, 1993; Sutton, 1996) which could influence the relationship between attitudes and intentions and PBC and intention (Cooke & French, 2011).

a. How is the Common-Sense Model (CSM) different from other health behaviour models?

The differences between the CSM and the other health behaviour models lie in three areas. First, the CSM describes the content of illness perceptions such as identity, timeline, causes etc. The CSM also specifies a link between illness perceptions and coping strategies (e.g. if my cold gets worse, I will see a doctor). Illness perceptions are the result of an interaction between physical sensation and previous experience with an illness. They specify the health threat and form the targets for coping. These targets are used to appraise coping which is suggested to mediate the relationship between illness perceptions and patients' well-being (Rutter & Rutter, 2002; Cameron &

Leventhal, 2003; Idler & Leventhal, 1999). No evidence for mediation of coping in this relationship was reported by Scharloo et al. (1998) and Moss-Morris, Petrie, & Weinman (1996) but illness perceptions did influence patients' well-being directly. Second, it specifies that illness perceptions are processed on two levels, the emotional and the cognitive level. Third, the CSM attempts to explain the cognitive processes between the way the illness and the self are represented and provides a more systematic and detailed description of the self-regulation mechanism compared to previous literature (Hooker & Kaus, 1994). This is achieved through a description of a detailed mechanism of the motivational and procedural factors that guide health-related behaviours in a given context. The CSM takes into account people's active involvement in problem-solving through their representations of their environment and themselves. It also includes the coping strategies people adopt in order to manage and prevent health threat as well as the way in which appraise their actions. Moreover, the CSM provides the opportunity to investigate a set of different health behaviours and not individual and focused ones such as smoking cessation, diet or sun protection (Trans-Theoretical Model of Health Behavior Change; Velicer, et al., 2006) which are important in the context of COPD. For instance, smoking cessation is the most effective way to slow progression and deterioration of the illness and diet can influence quality of life. The CSM can also be used to assess everyday behaviours in chronic illness which the other health models are limited due to their insufficient predictive validity. Last but not least, the CSM incorporates the emotional response to illness while the other models do not. For all these reasons, the Common Sense Model (CSM) of self-regulation (Leventhal et al, 1980) or illness perception model, was deemed the most appropriate to be used in this research.

3.3 Illness perceptions in chronic illness

Illness perceptions have been associated with a number of different outcomes in patients with a variety of physical illnesses. A meta-analytic review of the CSM by (Hagger & Orbell, 2003) provided support for the role of illness perceptions in a broad range of chronic diseases based on 45 studies. Hagger and Orbell (2003) identified and classified various types of coping strategies regarding illness beliefs and conducted a meta-analysis of the relationships between these behaviours and illness perceptions embedded in the CSM. Findings indicated significant and positive associations between the dimension of identity and coping strategies adopted by

patients, in particular, avoidance and expression of emotions. The latter was associated with the control that patients perceive they had over their illness. Perceived control was also related to cognitive reappraisal and coping strategies focusing on problem-solving. Patients who perceived their illness to be curable or controllable were more likely to have improved psychological, social and physical function (Hagger & Orbell, 2003). Cure and control were negatively associated with distress and disease status (Hagger & Orbell, 2003). The dimensions of consequences, timeline and identity were negatively correlated to psychological status, physical and social functioning and vitality levels. The authors concluded that examination of studies confirmed the expected relationships between illness perceptions, coping strategies and outcomes.

The number of studies included in the different health conditions examined was small and different illnesses could have been associated in different ways with illness perceptions. Moreover, most of the studies were cross-sectional which prevents conclusions on causal relationships. Effect sizes were also small. Cross-sectional studies can only capture illness perceptions at one given point in time but illness perceptions are changeable (Bijsterbosch, et al., 2009), therefore results might differ later on. Meta-analysis results showed significant variability in the strength of correlations (Hagger & Orbell, 2003). For instance, correlations found between illness perceptions and coping behaviours were low-to-moderate compared to the ones between illness perceptions and outcomes which were strong. Outcomes included physical functioning, psychological distress and well-being, role and social functioning, vitality and disease state. Similar patterns were observed between control/cure dimensions and generic and specific problem-focused coping (r_c=0.27, p<0.05) and (r_c=0.20, p<0.05) respectively, as well as social support seeking (r_c=0.08, p<0.05). Timeline also showed low correlations with cognitive reappraisal (r_c=0.14, p<0.05) and avoidance/denial (r_c=0.12, p<0.05). In contrast, correlations for outcomes were much stronger. For example, consequences, identity and timeline were strongly correlated to psychological well-being, role functioning, social functioning and vitality (range: -0.67≥ r_c≤0.11). In addition, consequences (r_c=-0.18, p<0.05) and identity (r_c=-0.28, p<0.05) were moderately-to-strongly correlated to physical functioning. Timeline did not show significant associations with physical functioning. Hagger & Orbell (2003) attributed these weak-to-moderate effect sizes partly to the variability in the assessment of coping and confounding feedback effects (Hagger and Orbell, 2003). The appraisal of the coping responses could have altered the representations of the illness and could have shown a different pattern at the time of assessment. These measures were too generic and not able to account for person-specific characteristics relating to coping

strategies, coping goals and perceived probability of success contradicting previous studies (Coyne & Racioppo, 2000).

A review conducted by French, Cooper, & Weinman (2006) found that illness perceptions in coronary artery disease patients were predictors of cardiac rehabilitation attendance. French et al. (2006) reported that patients' higher attendance was associated with higher perceived control and symptoms, more severe consequences and higher understanding of their illness.

3.3.1 Different illness perception clusters associated with different outcomes?

a. Past research on illness perceptions and quality of life

Illness perceptions are associated with different outcomes and illnesses. Timmers, et al. (2008) and Benyamini, Goner-Shilo, & Lazarov (2012) found strong associations between identity, personal and treatment control, consequences, and emotional representations and quality of life on patients with end-stage renal disease (ESRD) and contact dermatitis. More perceived symptoms and consequences, lower perceived control and more serious consequences were related to poorer physical, psychological and social well-being for patients with ESRD. Similarly, other studies have reported strong associations between identity, cure/control and consequences but not emotional representations in Huntington's Disease (Kaptein, et al., 2006), rheumatoid arthritis (Groarke, Curtis, Coughlan, & Gsel, 2005), chronic fatigue syndrome (Heijmans, 1998; Moss-Morris, Petrie, & Weinman, 1996) and psoriasis (Scharloo, et al., 2002). There are variations in the patterns and strength of the dimensions depending on the disease such as Huntington's (Helder, et al., 2002) and systemic sclerosis (Arat, et al., 2012) which have been attributed to variability in the measures used.

Definition and measurement of QoL has been a frequent matter of discussion in the literature (Gerritsen, Steverink, Ooms, & Ribbe, 2004; Bowling 2005). The degree to which QoL can be measured objectively has been disputed because even when "objective" measures such as financial, social and health markers (UNDP, 1998) are employed, the scope of the measures is narrow. It does not include other domains which contribute to QoL such as psychological and social participation and identity

which are assessed through an individual's "subjective" experience (Costanza, et al., 2008). However, the presence of physical disability or illness does not necessarily translate into poorer QoL. A detailed discussion of QoL was provided in Chapter Two.

Illness perceptions do not function as separate entities but can form clusters. For example, example, Le Grande, et al. (2012) found not all patients who suffered from the same illness to have similar illness representations and their quality of life varied accordingly. The authors observed different profiles of illness perceptions in different groups of cardiac patients within the sample studied. Le Grande et al. (2012) identified at least five different patterns of illness perceptions: (a) patient who focused heavily on consequences; (b) patients who had weak emotional representations; (c) patients who perceived high personal and treatment control; (d) patients who perceived low control and severe consequences and (e) patients who perceived even lower control and extremely severe consequences of their illness. The last two patterns were associated with poor quality of life while the first three with good quality of life.

In a review of the dimensions that showed strong associations with quality of life and functional outcome in asthma, (Kaptein, Klok, Moss-Morris, & Brand, 2010) reported that identity, control, emotional representations and illness coherence were consistently related to patients' well-being. Specifically, perceptions of stronger personal and treatment control as well as chronic timeline and weaker emotional representations were related to better quality of life and higher functioning. In contrast, patients who perceived their asthma to have severe consequences on their lives, and had low perceived personal and treatment control were more likely to experience greater limitations in functioning and poorer quality of life.

A further outcome associated with illness perceptions is disability and work disability. More perceived consequences were consistently associated with higher disability levels (Boot, Heijmans, van der Gulden, & Rijken, 2008; Bijsterbosch et al., 2009; Moss-Morris et al., 1996). Moss-Morris et al. (1996) found a significant relationship between identity, control and causes and disability. Moss-Morris et al.'s (1996) participants, however, were had only chronic fatigue syndrome while Boot et al. (2008) included various diseases in their study. Furthermore, Moss-Morris et al. (1996) investigated disability in general while Boot et al. (2008) focused on work disability. Bijsterbosch et al. (2009) reported correlations between identity and consequences and disability in osteoarthritis patients and observed changes in illness perceptions and the degree of disability in time. At 6 year follow-up patients' disability levels had increased

and showed associations with stronger identity and consequences. Associations were also found with lower personal and treatment control, timeline, causes and emotional representations in patients with progressing disability. Bijsterbosch et al.'s (2009) study was longitudinal and confirmed previous findings regarding changes in illness perceptions over time (Foster, et al., 2008).

b. Past research on illness perceptions and psychological well-being

Certain illness perceptions emerge as strong predictors of psychological status. Consequences was the strongest and most consistent dimension associated with depression and anxiety in a number of conditions such as rheumatoid arthritis (Groarke et al., 2005), irritable bowel syndrome (Rutter & Rutter, 2002), breast cancer (McCorry et al., 2012), cardiac disease (LeGrande et al., 2012) and diabetes (Skinner, et al., 2011). LeGrande et al. (2012) did not find a relationship between consequences and depression possibly due to the use of different measures. Most other studies employed the Hospital Anxiety and Depression Scale (HADS) while LeGrande et al. (2012) used the Beck Depression Inventory II (BDI II). In addition to consequences, lower perceived personal and treatment control/cure were related to higher levels of depression and anxiety (Murphy et al., 1999; Groarke et al., 2005; Rutter & Rutter, 2002, McCorry et al., 2012; LeGrande et al., 2012). Half of the studies employed a longitudinal design, one was a randomized control trial (RCT) while the rest of the studies were cross-sectional. A variety of depression and anxiety measures were used but despite these differences and the heterogeneity in patient populations, the correlations between control and psychological status remained strong. Stronger perceived causes such as self-blame were related to pathological worry (Fortune, Richards, Main, & Griffiths, 2000). McCorry, et al. (2012) found that weaker beliefs about causes were associated with lower levels of distress in breast cancer patients. Both these studies were either over-represented by women or only included women due to the nature of the disease which could have increased the likelihood of bias in their findings.

c. Past research on illness perceptions and coping strategies

The illness perceptions strongly associated with coping involve identity and control/ cure found in various conditions such as Huntington's Disease (Helder et al., 2002; Kaptein et al., 2006), chronic fatigue syndrome (CFS) (Heijmans, 1998) and Addison's Disease (AD) (Heijmans, 1999). In patients with Huntington's Disease stronger perceived identity and higher perceived levels of control or cure were associated with mental disengagement from the illness and positive reappraisal and growth as well as social support seeking. Both studies employed a cross-sectional design, were conducted in the Netherlands, and had identical sample sizes. Helder et al. (2002) also reported that beliefs about longer duration of the illness were negatively related to passive coping. This was also supported by Heijmans (1998; 1999) who found further associations between passive coping and stronger consequences in CFS and AD patients. Heijmans (1998; 1999) assessed coping with the Utrecht Coping Questionnaire while Helder et al. (2002) and Kaptein et al. (2006) employed the COPD Inventory which could explain the difference in findings.

d. Past research on illness perceptions and HCA

Illness perceptions are associated with health care access. For example, stronger beliefs of perceived personal and treatment control were consistently related to higher rates of attendance at rehabilitation programmes for cardiac patients (Cooper, Lloyd, Weinman, & Jackson, 1999), higher perceived receipt of information regarding illness for cancer patients (Husson, et al., 2012), higher treatment adherence in diabetes (Broadbent, Donkin, & Stroh, 2011) and increased outpatient visits in psoriasis (Scharloo et al., 2002). In their prospective cohort study, Cooper et al. (1999) found correlations between higher levels of perceived control, stronger beliefs in the cause of the illness (e.g. lifestyle) and increased rates of attendance at cardiac rehabilitation programmes. Illness coherence was related to perceptions of higher provision of disease-specific information (Husson et al., 2012). Scharloo et al. (2002) found evidence for identity linked to number of outpatient visits in patients with psoriasis. This could have been due to the nature of the condition which could have influenced patients' perceptions of their illness. In diabetic patients, Griva, Myers, & Newman

(2000) found different illness perceptions associated with treatment adherence from Broadbent et al. (2011). The first study observed a relationship between higher perceived consequences and stronger identity beliefs and higher treatment adherence while the latter reported higher personal control and higher treatment adherence. This difference could be attributed to the sample sizes (64 vs 157) and the fact that Broadbent et al. (2011) distinguished between type 1 and type 2 diabetic patients.

3.3.2 Illness perceptions in COPD

Certain illness perceptions show stronger associations with certain outcomes depending on the disease. A review by Kaptein, et al. (2008) found that illness perceptions were significantly associated with a number of outcomes such as functional status and disability, depression, anxiety and quality of life. The authors reported that worse outcome defined by poorer QoL, more outpatient visits, poorer physical and social functioning were related to stronger illness identity (i.e. attribution of many symptoms to COPD), perceptions of lower control over the illness and stronger emotional representations such as higher anxiety, depression or catastrophizing. In contrast, higher perceived control and higher self-efficacy and more positive emotional representations were associated with better outcomes. These relationship patterns were in line with those found in other illnesses. It must be noted, however, that the number of participants in the studies varied from 10 to 266, most of the studies were cross-sectional, not all used the same instruments to measure illness perceptions and disease severity was not controlled in all. These limitations warrant caution when interpreting results and attempting to make causal attributions.

It is worth providing an overview of the relationship of illness perceptions and outcomes such as quality of life or health care utilisation in COPD. Some of the studies that are going to be discussed were included in Kaptein et al.'s (2008) review while others were not. Overall, the evidence indicates that more negative illness perceptions such as associating more symptoms to the disease, perceiving it to be chronic and having less control over the illness as well as perceptions of more severe impact of COPD on patients' everyday life is related to poorer outcomes in terms of QoL. Identity has consistently been reported to be related to physical and psychological outcomes in COPD. Scharloo et al. (1998) found associations between strong identity beliefs and physical, role and social functioning. The authors also observed strong correlations

with timeline, consequences and control (Scharloo et al., 1998, 2002; Fischer et al., 2007; Kaptein et al., 2008; Howard, Hallas, Wray, & Carby 2009). Patients who perceived their illness as chronic, with a severe impact on their life, and less controllable had poorer outcomes. Scharloo et al. (1998) did not focus only on COPD in their study but also included patients with rheumatoid arthritis and psoriasis. In a later longitudinal study, Scharloo et al. (2000) found only weaker identity beliefs to be related to better social functioning and better self-rated health. The measures used in the two studies were identical, therefore, the differences in illness perceptions found could have been due to the longitudinal design and the fact that the later study (Scharloo et al., 2000) included only COPD patients. On the other hand, Hoth, Wamboldt, Bowler, Make, & Holm (2011) found a single illness perception, instead of a combination of them, that was associated with quality of life and psychological status: causes. Patients who attributed their illness to psychological factors instead of smoking, a virus or genetic causes were more likely to report poorer quality of life and higher levels of depression and anxiety. The authors attributed this finding to the nature of COPD which can be due to a variety of underlying causes such as smoking, genetic and environmental factors. COPD patients may hold different beliefs regarding the causes of their condition. Patients with COPD also felt stigmatized and experienced self-blame and shame (Berger, Kapella, & Larson, 2011) especially since smoking is significantly involved in the emergence of COPD. These perceptions of causes and emotional impact were related to higher levels of depression and greater impact of COPD on health status (Laurin et al., 2012; Halding et al., 2011). Scharloo et al. (2007) found that patients' attributions of their illness to psychological factors were associated with their psychological status while Fischer et al. (2007) observed strong associations between weaker perceived identity and better quality of life in their participants with COPD.

Identity, timeline and consequences were strongly associated with the experience of panic (Howard et al., 2009). Patients who had a stronger illness identity (more perceived symptoms), believed that their illness would be chronic and have greater impact on their everyday activities were more likely to have experienced a panic attack within the previous 12 months. Howard et al.'s (2009) findings confirmed Scharloo et al. (1998) who reported the same dimensions and their relationship with poorer emotional adjustment. Scharloo et al. (2000) observed that lower perceived symptoms (i.e. weaker identity beliefs) were associated with improved social functioning and perceived health status. However, they did not find evidence for other illness perceptions. This

could be due to the fact that their study was longitudinal in contrast to the cross-sectional design that Scharloo et al. (1998) and Howard et al. (2009) had employed.

Illness perceptions have been linked to health care access suggesting that more negative illness perceptions are related to greater access to health care services. Variations in the conceptualization and measurement of health care access makes identification of the nature of this relationship more complicated compared to quality of life. Scharloo et al. (2000) found that patients' weaker belief in psychological factors as causes of their COPD was strongly correlated with a higher number of outpatient clinic visits while identity was related to prescriptions for disease-specific medications. Scharloo et al. (2000) reported that weaker identity beliefs were associated with seeking more distraction when trying to cope with the illness. Seeking more distraction was, in turn, associated with reduced prescription of COPD medications.

A further measure of health care access is attendance at pulmonary rehabilitation (PR) programmes. Fischer et al. (2009) found that weaker beliefs regarding effectiveness of treatment were associated with lower participation rates in pulmonary rehabilitation consistent with previous studies (Arnold et al., 2006; Fischer et al., 2007). Williams, Bruton, Ellis-Hill, & McPherson (2010) found that after completion of PR, patients' degree of breathlessness had not changed but their perception and management of breathlessness had. This suggested that patients' beliefs about their ability to exercise could have strengthened and their belief in their ability to manage dyspnoea whilst exercising had increased which could have led to a reduction of anxiety and panic. Possible desensitisation to perceptions of breathlessness through pulmonary rehabilitation was suggested as an explanation. However, due to the qualitative nature of their research a more detailed account of the mechanism of that effect could not be provided. Similarly, patients' negative perceptions of exercise consequences were related to their performance on the 6-minute walking test as well as to treatment response in mildly to moderately affected patients when controlling for physical confounders (Fischer et al., 2007). The aforementioned studies did not all use the same measures to assess illness perceptions and health care access. Therefore, variability in the findings could be attributed to the use of different measures.

Other health care access outcomes investigated include medication adherence. Higher perceived control appeared to be the strongest dimension associated with higher adherence with pulmonary medication. Khdour, Hawwa, Kidney, Smyth, & McElnay (2012) found that patient beliefs regarding the degree of treatment effectiveness and

about their health status were significantly associated with medication adherence. Increased patient understanding of their illness and of the effectiveness of their treatment were related to higher rates of adherence in patients with COPD. Similarly, COPD patients who felt more in control over their illness and had stronger perceptions of medication effectiveness were more adherent (George, Kong, Thoman, & Stewart, 2005). An overview of all the studies described above and their findings on the relationship between illness perceptions and HCA and QoL outcomes is provided in Table 3.1.

Table 3.1 Overview of the studies examining experiences/illness perceptions (IPs) and quality of life (QoL) and/or health care access (HCA) in patients with COPD

Authors	Sample size/Age	Objective	Assessment of IPs/experience	Assessment of QoL/HCA	Outcome measure(s)	Results
Arnold et al. (2006)	20 / M=67yrs	Reasons for participation & adherence in Pulmonary Rehabilitation	Qualitative approach	Semi-structured interviews	Pulmonary Rehabilitation participation & adherence	Positive doctor attitude to PR associated with higher attendance. Group support (PR) & higher self-confidence associated with better adherence. Lack of social support & inefficient coping with COPD negatively associated with adherence .
Berger et al. (2011)	16 / M=70yrs	Experience of social changes & stigma in COPD	Qualitative approach	Descriptive in-depth interviews, FEV_1, Charlson Comorbidity Index (CCI), ATS-DLD 78-A Breathlessness Scale, Functional Performance Inventory	Effect of COPD on social relationships & experiences with COPD-related stigma	Blame related to smoking from self & health professionals. Decrease in social activities partly due to avoidance of stigmatizing situations.
Earnest (2002)	7/ M=69yrs	Examination of patterns of adherence to oxygen in COPD	Qualitative approach, case-series	Semi-structured interviews, Brief Symptom Inventory (BSI), St. George's Respiratory Questionnaire (SGRQ), FEV_1	Adherence to oxygen therapy	Barriers to oxygen adherence: physical difficulty of use, self-consciousness, social stigma, lack of perceived Benefit, fear of side-effects.
Fischer et al. (2007)	12 / M=61yrs	Examination of patient beliefs before treatment & Pulmonary Rehabilitation goals	Qualitative approach	Semi-structured interviews	Patient beliefs about PR, treatment goals & reasons for participation & non-completion	Participation & non-completion related to patients' perceived disabilities, expected benefits & concerns about PR, practical barriers & low self-confidence in their abilities.
Fischer et al. (2009)	217 / M=63.4 yrs	Examination of drop-out & attendance rates in PR, and the role of patients' illness perceptions in PR	Illness Perceptions Questionnaire-Revised (IPQ-R)	6-minute walking test, dyspnoea & perceived exertion scale (Borg CR10), Medical Research Council (MRC) dyspnoea scale, FEV_1	PR drop-out & attendance rates & reasons, illness perceptions as predictors of drop-out & & attendance in PR	Reasons for non-completion: medical, smoking, living alone, lower fat free mass low treatment control. Socio-demographic, clinical or psychological variable were not predictors of PR non-completion.

Authors	Sample size/Age	Objective	Assessment of IPs/experiences	Assessment of QoL/HCA	Outcome measure(s)	Results
Fischer et al. (2010)	87 / M=63 yrs	Examination of patients' illness perceptions before & after PR and after diagnosis	Illness Perceptions Questionnaire-Revised (IPQ-R)	FEV_1, 6-minute walk test, dyspnoea & perceived exertion scale (Borg CR10), Chronic Respiratory Questionnaire (CRQ)	Changes in illness perceptions in after PR & diagnosis of COPD	Longer time after diagnosis associated with longer duration of illness, more consequences, less control. After PR, achieving set goals was associated with less concern about negative consequences of of COPD & stronger cyclical timeline & personal control.
Fischer et al. (2012)	166 / M=63 yrs	Examination of negative affect & exercise beliefs In relation to 6-minute walk test performance & treatment outcomes	Questionnaire about perceived exercise necessity & concerns, Hospital Anxiety & Depression Scale (HADS)	6-minute walk (6-MW) test, FEV_1, dyspnoea & perceived exertion scale (Borg CR10)	6-minute walk test outcome & improvement in walk distance after PR	6-MW distance was positively associated with younger age, male gender, better lung function & fewer concerns about exercise. Physiological & psychological variables were not associated with treatment response (increase in walk distance). Mildly & moderately affected patients treatment response was negatively related to concerns about exercise.
George et al. (2005)	276 / M=71yrs	Examination of predictors of medication adherence and health beliefs & experiences	30-item questionnaire about health beliefs & adherence behaviours	Medication Adherence Report Scale (Weatherall, et al.)	Medication adherence	Medication adherence positively associated with acceptance of disease course & treatment, knowledge & faith in treatment, good patient-doctor communication & routinisation of treatment.
Halding et al. (2011)	18 / Range: 52-81yrs	Examination of daily life experience of patients with COPD	Longitudinal and descriptive qualitative approach	Thematic interview, questions about everyday experience of COPD	Daily experience of COPD	Stigma of self-infliction & moral weakness associated with COPD. Guilt, self-blame & negative perception of identity.
Hoth et al. (2011)	394 / 59% >65 yrs	Examination of patterns of causal attributions for COPD in relation to health behaviours & symptoms	Illness Perceptions Questionnaire-Revised (IPQ-R)	Smoking status questions, Physical Activity Scale for the Elderly (PASE), Hospital Anxiety & Depression Scale (HADS), Modified Medical Research Council Scale (MRC), St. George's Respiratory Questionnaire (SGRQ), Health Care Utilisation questionnaire	Health behaviours, QoL, anxiety & depression, health care utilisation, breathlessness, causal attributions	Main causal attributions for COPD were: smoking, heredity, pollution & personal behaviour. Higher attribution of COPD to psychological factors was associated with poorer emotional adjustment & QoL.

Authors	Sample size/Age	Objective	Assessment of IPs/experiences	Assessment of QoL/HCA	Outcome measure(s)	Results
Howard et al. (2009)	59 / M=62.4yrs	Examination of the association between illness perceptions & panic in patients with COPD	Illness Perceptions Questionnaire-Revised (IPQ-R)	Hospital Anxiety & Depression Scale (HADS), the Panic Disorder Severity Scale-Self-Report (PDSS-SR), St. George's Respiratory Questionnaire (SGRQ), FEV_1	Panic, anxiety & depression, daily life, QoL	Panic was independent of disease severity, more perceived symptoms stronger perceived duration, conse-consequences & emotional repre-sentations were associated with more panic attacks. Control/cure beliefs were related to more adaptive functioning. Control was not related to panic .
Khdour et al. (2012)	173 / M=67yrs	Examination of the effect of demographic & psycho-social factors on medication adherence in COPD	Hospital Anxiety & Depression Scale (HADS), COPD knowledge questionnaire, COPD self-efficacy scale, Health Belief Model (HBM) questionnaire	Self-reported adherence (Morisky scale), perceived medication effectiveness scale	Medication adherence	Demographic variables (e.g. age, gender, SES) were not related to medication adherence. Perceived treatment ineffectiveness,comorbi-dities, depression & perceived barriers were independently related to non-adherence.
Scharloo et al. (1998)	244 / M=64.3yrs	Examination of relationship between illness perceptions & coping behaviours & daily functioning	Structured interview about patient cognitions & illness perceptions & Illness Perception Questionnaire (IPQ)	Utrecht Coping List, Daily Activities of Life (DAL), Medical Outcomes Study Short Form General Survey (MOS), FEV_1	Coping strategies & daily functioning	Strong illness identity, passive coping, long illness duration belief, strong perceived consequences, and low score on medical variables were related to worse physical, role & social functioning. Coping through social support & control /cure beliefs were associated with better functioning.
Scharloo et al. (2000)	64 / M=63.8 yrs	Examination of association between illness perceptions & coping and outcome in COPD	Illness Perceptions Questionnaire (IPQ), short structured questionnaire to elicit illness perceptions	Utrecht Coping List (UCL), MOS-SF20, FEV_1, health care utilisation (hospital/outpatient visits, medication strength)	Coping & outcome & daily functioning	Initial illness perceptions & coping were associated with social functioning mental health, health status perceptions total functioning score & visits to outpatient department & prescriptions.
Williams et al. (2010)	9 / M=65.7 yrs	Exploration of the impact of Pulmonary Rehabilitation (PR) on patients' activity levels & breathlessness	Qualitative, interview-based approach	Pre- and post-pulmonary rehabilitation interviews	Qualitative interview	Post-PR: change in patients' perceptions of breathlessness & lower fear of activity. PR exerted an influence on physical, social activities, reducing isolation feelings

3.3.3 Assessment and measurement of illness perceptions

The IPQ was first developed by Weinman, Petrie, Moss-Morris, & Horne (1996) to measure the five dimensions of the Common Sense Model in a quantitative way. A shorter and simpler version of the IPQ was constructed by Broadbent, Petrie, Main, & Weinman (2006) featuring a single-item scale approach instead of the Likert scale in the original IPQ. The new scale provided the option of measuring illness perception on a continuous linear scale and showed good discriminant, predictive validity and test-retest validity (Broadbent et al., 2006). In addition, a revised version of the IPQ was developed by Moss-Morris, et al. (2002) which addressed concerns regarding the IPQ's psychometric abilities. A number of causal items including smoking, stress or worry, heredity, and chance or bad luck were added. Moss-Morris et al. (2002) concluded that there were four primary factors: psychological attributions, risk factors, immunity, and chance. It was emphasized that the subscales of the revised IPQ, depending on the nature of the illness, would vary in their applicability. This was due to different primary causal attributions made by patients who have different illnesses. The IPQ-R also contains questions addressing all the dimensions mentioned above including the newer items such as the distinction between personal and treatment control, cyclical timeline, illness coherence and emotional representations. Reliability and validity of the IPQ-R were reported to be good (Moss-Morris et al., 2002; Hagger & Orbell, 2005).

3.3.4 Modification of illness perceptions

Illness perceptions change and can influence various outcomes such as disability and pain. Changing perceptions about consequences, control and emotional response to pain significantly predicted the degree of disability in people who were suffering from low back pain (Foster et al., 2008). Bijsterbosch et al. (2009) reported similar effects for patients with osteoarthritis. In their study, changing perceptions about consequences and control but also about the chronic nature of the illness, its coherence and emotional response were associated with disability changes even after six years. Change in perceptions and physical outcomes in osteoarthritis was also reported by Kaptein, Bijsterbosch, et al. (2010).

Interventions targeting functioning and education of patients can modify illness perceptions. For example, in patients with COPD, Fischer et al. (2010) found that timeline and consequences strengthened after receiving the diagnosis and over a period of time after that while perceptions of control showed a gradual reduction. It would be expected that coping and subsequently control over the illness would improve with the passing of time since the patient would have more time to adjust to the illness. Fischer et al. (2010) showed that pulmonary rehabilitation increased patients' perceptions of control. Perceived benefit gained from pulmonary rehabilitation was related to stronger perceptions of consequences and timeline. Fischer et al. (2010) attributed the increase in timeline to exacerbations and information provided during pulmonary rehabilitation. Pulmonary rehabilitation could have made patients more aware of their symptoms and could have strengthened their perceptions of timeline.

Illness perceptions are significantly associated with various physical and mental outcomes. It would be helpful to develop interventions that would modify illness perceptions with the aim to improve patients' functioning. Studies have explored the effect of interventions targeting illness perceptions and found a positive impact on patients' health status. Improving patients' perceptions of coherence, consequences, timeline and causes could increase the likelihood of their return to usual activities and work. Broadbent, Ellis, Thomas, Gamble, & Petrie (2009) and Petrie, Cameron, Ellis, Buick, & Weinman (2002) found that a brief illness perceptions modification programme had two positive outcomes on patients who had suffered myocardial infarction. First, it had modified patients' perceptions about their illness and second, it had decreased recovery time and facilitated return to work. Beneficial effects of modification of illness perceptions were found for diabetes (Keogh, et al., 2011) and psoriasis (Fortune, Richards, Griffiths, & Main, 2004). Visual representation facilitated modification of illness perceptions. For instance, final stage kidney failure patients were presented with a container and a phosphate solution which represented the stomach and food, respectively, in order to demonstrate the way in which their medication exerted its effect (Karamanidou, Weinman, & Horne, 2008). This intervention aimed to increase patients' understanding of the reasons why frequent intake of their medication was crucial. Findings showed that patients' treatment beliefs and knowledge improved in the short-term but their perceived need for treatment medication and medication compliance did not increase significantly after the intervention. Modern technology in the form of content-specific text messages has also been used to modify negative illness perceptions in young people suffering from asthma and to increase their

medication adherence with persisting effects even at 6 months after discontinuation of the texts (Petrie, Perry, Broadbent, & Weinman, 2011).

The presence of co-morbidity requires a slightly more complex approach because multiple conditions can influence patients' illness perceptions differently such as identity, cause, illness coherence and consequences (Bower, et al., 2012; Anderson et al., 2001). Different illnesses could present with distinctive perceptions or interlinked perceptions extending through different conditions. For example, multiple medications influenced the way patients attempted to make sense of their illness. Illness perceptions relating to different diseases would compete with each other and in attempting to regulate one set the other may be misregulated (Detweiler-Bedell, Friedman, Leventhal, Miller, & Leventhal, 2008). For example, patients suffering from both depression and diabetes would probably respond well to interventions targeting depression. These, however, could increase their appetite and lead to dysregulation of their blood sugar (Detweiler-Bedell et al., 2008).

Taking into consideration that negative illness perceptions are associated with a variety of outcomes in a range of patient groups, they should be embedded into routine care as early as possible in the recovery process (Petrie & Weinman, 2012).

3.3.5 Conclusion

Illness perceptions play a very important role in adjustment, management and coping in various conditions as well as in COPD. More positive illness perceptions are related to more favourable outcomes in terms of physical, social and emotional functioning while more negative illness perceptions are associated with greater health care seeking. Previous evidence for the link between SES and the way patients make sense of their illness also provide indications for a possible association between lower SES and more negative illness perceptions. This chain of thought provided grounds for the hypotheses used in this research examining (a) whether the relationship between lower SES and more impaired health care access was mediated by more negative illness perceptions and (b) whether the relationship between lower SES and poorer QoL was mediated by more negative illness perceptions.

The examination of illness perceptions as a mediator in the relationships between SES and HCA and SES and QoL could prove to be very useful in elucidating likely pathways

of SES on HCA and on QoL in COPD. However, the literature has also provided evidence for a further psychological variable showing strong associations with both SES and QoL and self-management in chronic illness and COPD: self-efficacy. Including self-efficacy in this thesis could possibly add to our understanding of the nature of associations between SES and HCA and SES and QoL in COPD. For example, if a COPD patient had a low level of confidence i.e. low self-efficacy in their ability to attend pulmonary rehabilitation or engage in physically activity this might be more or equally important as their beliefs about their condition. Knowing what would be required in order to improve their health status and taking action to do so are two different concepts which might be operating independently or supplement each other. Previous literature has provided evidence for associations between SES, QoL and both illness perceptions and self-efficacy. Thus, examination of illness perceptions and self-efficacy as possible mediators in the relationship between SES and HCA and SES and QoL could contribute significantly to increasing our understanding of patient beliefs and experience of emotions regarding the experience, coping and management of COPD such as attendance at PR and adherence to treatment.

One possible limitation of illness perceptions and self-efficacy is that both can vary in time, and age as well as environmental and social influences can make their examination more difficult. This is especially true for COPD which is a disease that progresses gradually and is more common in ages above 40 years. Moreover, the definitions and measures used to assess quality of life but also health care access might complicate matters slightly due to their variability. With regard to health care access, patients' illness perceptions and level of self-efficacy may also play an important role in the nature of interaction between patients and health professionals. The nature of this interaction could be influenced by the perceptions and confidence of the patient as well as the health care provider. This is to say that although illness perceptions and self-efficacy could provide significant information on the patients' side, further external factors that could be exerting an influence need to be considered in order to increase our understanding in a more reliable way.

Illness perceptions and self-efficacy can be modified in order to change maladaptive cognitions and improve outcomes. Therefore, identification of the role of illness perceptions and self-efficacy in the relationship between SES and HCA and QoL could increase our knowledge and interventions incorporating both concepts could improve well-being for patients with COPD.

3.4 Self-efficacy in chronic illness and COPD

3.4.1 What is self-efficacy?

The concept of self-efficacy was introduced by Bandura (1977) and refers to an individual's perception of the degree of control they have over their actions so that they can achieve desired outcomes. It reflects the degree of self-confidence people have in their capability to adapt effectively to different demands and challenges of their environment, and exert their control over various activities and conditions.

Self-efficacy is one of the elements comprising Social Cognitive Theory (SCT) (Bandura, 1986). SCT is based on three dimensions that interact with each other in a reciprocal way: (a) personal determinants, (b) behavioural determinants and (c) environmental determinants. The interaction between people's individual attributes, the behaviour they engage in and the environmental influences they are subjected to determines their functioning. People exert some control over the way events are shaped and the direction their lives take but are also influenced by them. A visual representation of this interaction is presented in Figure 3.2 (Bandura, 2012).

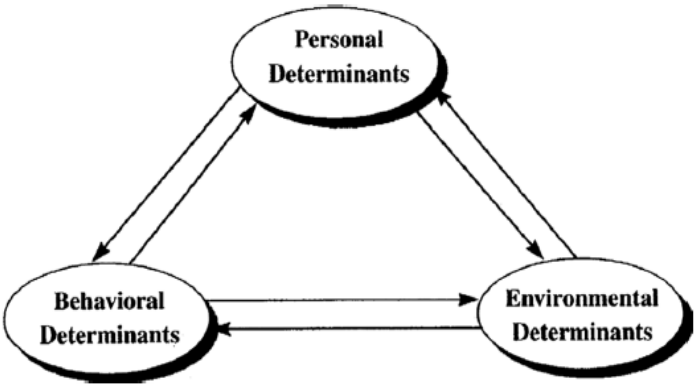


Figure 3.2 Visual representation of the interaction between the three determinants within the causal model of Social Cognitive Theory (taken from Bandura, 2012)

This interaction between the three determinants and their influence on an individual's perceived self-efficacy led to its inclusion in the current thesis in the attempt to examine whether lower socio-economic status might be associated with self-efficacy, health care access and quality of life COPD. Taking into account the impact of the

environmental and individual characteristics on behaviour and the role of self-efficacy, it would be plausible to assume that they might also exert an influence on whether and how patients seek access to health care services or pursue behaviours that would benefit their well-being. For example, higher deprivation might lower patients' perceived self-efficacy and prevent them from accessing health care services due to their belief that they would be unsuccessful in doing so. This interaction between environment and self-efficacy is reflected in Bandura's (2012) theory of the existence of three types of environments that surround people. These include the imposed environment, the selected environment and the constructed environment. The first is more or less imposed on humans regardless whether it is to their liking or not. People can exert some control over how this environment is construed and how they react to it. The selected environment refers to the fact that it has to be selected and activated by an individual. The activities people engage in and the choices they make can influence the direction their lives take. Finally, environments can also be created to enhance people's control over their lives. The importance of the individual as an acting agent in this setting emphasizes the role of self-efficacy. Depending on how capable people perceive themselves to be, they can act in specific ways in order to select or control their environment to a certain extent. The higher they perceive their self-efficacy to be the more likely they are to engage in actions that will shape their environment to their liking. But could lower SES and self-efficacy be associated and could this relationship have a negative influence on health care access and quality of life? This will be discussed in the following sections.

3.4.2 How does self-efficacy operate?

People's perceived belief in their abilities differs depending on the type of situation in which they find themselves or the type of activity they engage in (Bandura, 2012). Self-efficacy is derived from four sources: (a) perceived mastery; (b) social modelling; (c) social persuasion; and (d) somatic and psychological status (Bandura, 2012).

People from more deprived background could be subject to a variety of influences which could foster or lower their self-efficacy levels. On the one hand, due to more limited social and financial resources, lower SES groups would be more likely to have greater experience of failure in various tasks such as in academic or occupational settings. This could increase their perseverance and resilience to achieve the goals

they have set. On the other hand, more affluent individuals might be less likely to experience failure and thus would have lower self-efficacy levels because they did not need to persevere and develop resilience to situations. Alternatively, due to more resources available to them, they might experience a greater sense of control over their lives and so have higher levels of self-efficacy. Social persuasion as well as social modelling, due to exposure to similar experiences observed in their networks of acquaintances, friends and family, would probably contribute to strengthening these attributes. Higher levels of depression and anxiety that might affect more deprived populations due to inability to cater for everyday requirements could discourage further attempts or make these attempts less successful. For example, in patients with COPD, higher deprivation might encourage and strengthen their attempts to seek the health care services they require thus providing them with greater health care access than expected. Greater health care access would most likely have a beneficial effect on peoples' QoL. In contrast, higher deprivation could also have a negative impact on peoples' quality of life due to depression and anxiety and continuous attempt to secure services they need.

Preventive self-efficacy in health behaviours significantly influenced actual health behaviour and well-being (Bandura 1986, 1992; Gecas, 1989; O'Leary, 1985). People with higher self-efficacy levels were more likely to engage in preventive actions such as exercise, smoking cessation and to have more positive perceptions of their health status in comparison to people with lower self-efficacy (Bandura 1986; Gecas 1989; Bandura, 1992).

On an individual SES level, high self-efficacy was positively associated with higher occupational status and income (Hughes & Demo, 1989) as well as educational attainment (Gecas & Seff, 1989). The attempts to explain the pathways of the influence of SES on self-efficacy involve two aspects. First of all, the wide range of resources available to people of higher SES increases the opportunity for everyday activities and as a consequence the likelihood of mastery experiences (Hughes and Demo 1989). Secondly, self-efficacy is reinforced by occupational characteristics that are related to higher SES such as the degree of complexity and independence at work (Gecas & Schwalbe, 1983). Both of these proposed explanations rely on the principle that successful engagement determines the level of perceived self-efficacy through increasing the degree of perceived mastery derived from this experience. This perceived mastery can generalise to other domains of activity (Bandura, 1986).

However, Boardman & Robert (2000) claimed that neighbourhood SES was more influential on perceived self-efficacy than individual-level SES. People living in more deprived neighbourhoods were more likely to report lower self-efficacy as compared to people living in less deprived neighbourhoods. Two possible explanations have been proposed on how SES could affect self-efficacy superseding the individual-level SES: (a) spatial limitations on the availability of resources accessing and exiting neighbourhoods; in other words, institutional discrimination places a constraint on the flow of resources into more deprived neighbourhoods. Thus, a person with low SES who is residing in a high SES area is offered more opportunities in comparison to a person with low SES in a low SES neighbourhood. This would gradually lead to increased daily activities and subsequently greater likelihood of acquiring mastery experiences; and (b) the nature of the surrounding social context which includes people with high perceived self-efficacy who might increase the opportunities for a wider range of vicarious mastery experiences. This resembles the social modelling theory described above where people with low self-efficacy may be more likely to experience vicarious mastery through their exposure and observation of people with higher self-efficacy who live in the same surroundings (Bandura, 1986).

The aforementioned speculations were based on the assumption that self-efficacy can not only exert a direct effect on behaviour but can also influence behaviour through other mediating variables such as goals, outcome expectations and social factors (Bandura, 1986). These variables provide a model for self-regulation and motivation for action. The goals that individuals set for themselves are influenced by their values and can function as a guide or incentive for action and depend on their beliefs in their abilities (Locke & Latham, 1990; Seo & Ilies, 2009). Outcome expectations pertain to physical or social costs and benefits. They also involve reflections regarding one's response to these expectations which could be positive or negative. Social factors such as environmental structures can influence the way people react. If an individual recognises the opportunities and potential it can provide, they will act accordingly in order to benefit from them. Individuals with low self-efficacy would be easily intimidated and discouraged to act when facing institutional barriers. Instead, those with high self-efficacy would find ways to overcome them. In the context of health, people from more deprived backgrounds would be more likely to be intimidated and not pursue the health care services they required in a persistent fashion. The direction of the influence of SES, self-efficacy and HCA is not clear. Therefore, this thesis explores whether lower SES would be associated with lower self-efficacy, which, in turn would be related to lower HCA.

Self-efficacy varies from person to person, between functioning domains and within elements of these domains. In order to acquire a comprehensive and valid view of an individual's self-efficacy, the factors that determine performance of a specific action and the barriers that prevent realisation of the goals that have been set need to be identified Bandura (2006b). For example, patients with COPD benefit greatly from pulmonary rehabilitation in terms of dyspnoea, physical and psychosocial functioning. However, achieving this outcome would require them to regulate their efficacy in three different controllable activity domains. First, higher self-efficacy would be required to visit the GP and ask for available options to improve their health status. Secondly, once patients received a referral for pulmonary rehabilitation, they would need to attend and complete it despite perceived barriers such as fatigue or dyspnoea. Thirdly, maintaining their physical exercise after completion of the programme in order to sustain the benefits acquired from it would be essential as well. Focusing on only one of these aspects to improve physical and psychosocial functioning through self-efficacy would probably be ineffective. A combination of all three is required to increase the likelihood of achieving the desired result. Depending on the individual and their circumstances, these three aspects may vary and all would probably be affected by SES. Making an appointment with a GP might be harder due to patients' limited access to health care due to deprivation in their area of residence and more limited availability of services; attending and completing PR might be more difficult because of lack of programmes in the area, long waiting lists or no available transportation due to patients' financial restrictions; maintaining the benefits and exercise regime learned in PR might be harder due to inability to subscribe to a local gym because of patients' low income.

Self-efficacy theory has been applied in a variety of domains of human psychosocial functioning. It has been used to explain anxiety disorders (Mystakidou, et al., 2012; Bandura et al., 1980; 1982), depression and abstinence in substance use (Greenfield, Venner, Kelly, Slaymaker, & Bryan, 2012; Kanfer & Zeiss, 1983), weight loss (Byrne, Barry, & Petry, 2012), professional choices, career course and academic (Richardson, Abraham, & Bond, 2012) and athletic achievements (Cetinkalp, 2012; Wu, 2012). Despite exploring different aspects of psychosocial functioning, studies indicated that people's perceived self-efficacy has a significant impact on people's motivation, performance and health-related behaviours.

3.4.3 Self-efficacy and health

Self-efficacy is distinguished between generalised and disease-specific self-efficacy. Generalised perceived self-efficacy affects people's choices and behaviours in various domains such as the adoption or avoidance of health behaviours or chronic illness management. Depending on an individual's level of self-efficacy, their efforts and persistence in reducing substance abuse such as alcohol or smoking, increasing physical activity, improving their diet and employing relaxation techniques will be affected accordingly (O'Leary, 1985).

Self-efficacy is important in explaining and predicting complex behaviours and long-term changes in behaviour and is helpful in patient assessment and illness management (Barlow, Wright, Sheasby, Turner, & Hainsworth, 2002; Holman & Lorig, 1992; Lorig, 2001; Lorig & Holman, 2003). Identifying areas with low self-efficacy can contribute to the design of patient education programmes. This enables targeting and tailoring self-management education according to patient needs and characteristics. In addition, by assessing self-efficacy over time, it is possible to appraise the effectiveness of patient education programmes. Measurement of self-efficacy can help identify individual differences between patients, and can predict important health outcomes such as hospitalisations or quality of life (Frei, Svarin, Steurer-Stey, & Puhan, 2009). Illness-specific versus generalised self-efficacy measures have been developed in order to assess the relevant domains of functioning that are of particular interest. These self-efficacy scales focus on capturing patient beliefs about their ability to successfully perform certain activities and measure the strength of that belief (Bandura, 1977; Bandura, 2006a). Disease-specific instruments can assess selected patient-reported outcomes, for example, health-related quality of life (Kirshner & Guyatt, 1985). Maintaining good quality of life involves engaging in complex activities like self-monitoring, adaptation of medication, and long-term changes in behaviour where self-efficacy plays a critical role. Frei, et al. (2009) found a greater number of self-efficacy instruments for diabetes compared to asthma, arthritis, or COPD and none for cardiac failure. Frei et al.'s (2009) findings emphasized that there were significant methodological limitations in the development and validation of most of the instruments examined.

a. Self-efficacy and health-related behaviours

Self-efficacy can mediate and affect health behaviours or outcomes such as quality of life. Haas, Kimmel, Hermanns, & Deal (2012) found that self-efficacy mediated the relationship between cancer-related fatigue and quality of life in women with breast cancer. Based on their findings, the authors suggested that enhancing self-efficacy may reduce the impact of fatigue on physical activity and indirectly improve QOL in this patient population. Self-efficacy was correlated to physical activity levels in women receiving treatment for breast cancer which influenced their quality of life consistent with previous studies (Perkins, Baum, Carmack Taylor, & Basen-Engquist, 2009; Pinto, Rabin, & Dunsiger, 2009; Perkins et al., 2009). Higher SES in terms of income level was associated with higher self-efficacy in women with breast cancer who were receiving chemotherapy (Haas, et al., 2012) supporting previous evidence (Bandura, 1997). Women with fewer financial resources had lower levels of self-efficacy. Haas (2012) emphasized that while fatigue and self-efficacy accounted for 28% of the variance in physical activity levels, other variables such as socio-economic status or co-morbidities had to be taken into account too. Motl, McAuley, Wynn, Sandroff, & Suh (2013) found that physical activity and self-efficacy were associated with health-related quality of life (HRQOL) in patients with multiple sclerosis (MS). Self-efficacy was suggested to be a mediator due to stronger associations with HRQOL compared to physical activity. Brink, Alsén, Herlitz, Kjellgren, & Cliffordson (2012) found that higher general self-efficacy was not only associated with better HRQOL but that it was also mediated by fatigue. Higher general self-efficacy was correlated to lower fatigue which, in turn, was associated with better mental and physical health. Brink et al. (2012) suggested that severe illness consequences such as fatigue may affect patients' HRQOL and their levels of self-efficacy significantly echoing previous research (Sarkar, Ali, & Whooley, 2009).

Knittle, et al. (2011) found that self-efficacy influenced arthritis pain indirectly through attainment of physical exercise goals set by the patients. They suggested that this finding might be indicative of the fact that patients with higher self-efficacy were more likely to strive for higher goals regarding physical exercise than those with low self-efficacy. Setting higher goals would probably involve more a demanding exercise regime which could be more beneficial to patients' quality of life (QoL). Knittle et al. (2011) attributed this to patients' stronger perception of control over their illness. In

addition, the attainment of goals could be associated with stronger feelings of control over their disease and improved QoL based on previous findings involving chronic obstructive pulmonary disease (COPD) patients (Fischer et al., 2010).

b. Self-efficacy and health outcomes

Perceived self-efficacy was found to be a significant predictor of therapeutic outcome in various domains and diseases (Bandura, 1992). For example, individuals with higher self-efficacy levels were more successful in controlling pain in comparison to those with low levels of self-efficacy (Altmaier, Russell, Kao, Lehmann, & Weinstein, 1993; Litt, 1988). Pain could also be decreased through the implementation of behavioural interventions targeting the increase of self-efficacy (Buhrman, Nilsson-Ihrfelt, Jannert, Strom, & Andersson, 2011; Lorig, Ritter, Laurent, & Plant, 2008). A further domain that was positively associated with self-efficacy was the rate of recovery of cardiovascular function in coronary heart disease patients. Patients' cardiovascular function was improved by reinforcing their beliefs in their physical ability and cardiac efficacy (Taylor, Bandura, Ewart, Miller, & DeBusk, 1985). An increase in self-efficacy had positive effects on stress management (Lazarus & Folkman, 1987). Stress management plays a significant role in quality of life because the way people cope with stressful situations has an impact on their immune system (Wiedenfeld et al., 1990). Higher levels of stress due to lower self-efficacy would be more likely to weaken the immune system and increase vulnerability to infections and other health problems.

Self-efficacy has also a significant impact on other domains such as physical, psychological well being in chronic illness. For example, in coronary heart disease (CHD) populations, patients who had low perceived self-efficacy experienced worse health status. This involved greater experience of symptoms, poorer functioning and poorer quality of life (Sarkar, Ali, & Whooley, 2007). In addition, low levels of cardiac self-efficacy had an impact on disease consequences. Thus, low self-efficacy was linked to increased likelihood for heart failure and hospital admissions for CHD patients. Improved self-management and better mental status were related to higher self-efficacy in patients who had suffered a myocardial infarction (Joekes, Van Elderen, & Schreurs, 2007) as was quality of life (Boersma, Maes, Joekes, & Dusseldorp, 2006).

c. Self-efficacy and disease management

Disease management in chronic illness includes healthy diet and exercise, medication adherence and health literacy all of which contribute to patients' QoL. Medication adherence is part of disease management and crucial to a patient's recovery and coping with an illness. Studies exploring the association between patients' medication self-efficacy and disease outcome in HIV found contradictory evidence. Some found support for higher levels of self-efficacy and improved HIV medication adherence (Catz, Kelly, Bogart, Benotsch, & McAuliffe, 2000; Cha, Erlen, Kim, Sereika, & Caruthers, 2008). Their results triggered further search into other possible variables influencing self-efficacy such as health literacy which refers to a patient's knowledge about their disease. In HIV patients, self-efficacy mediated the relationship between disease education and medication adherence (Wolf, et al., 2007). Belief in one's ability to follow the treatment regime under varying circumstances was suggested to influence a patient's ability to acquire, understand and follow medical recommendations. Others did not find support for self-efficacy mediating the relationship between health literacy and treatment adherence (Colbert, Sereika, & Erlen, 2012; Paasche-Orlow et al., 2006; Wolf, et al., 2004). Authors attributed their results to different measures of health education and adherence used in the studies.

d. Can self-efficacy be modified?

Examination and knowledge of the various factors influencing self-efficacy and its impact on other variables can contribute to understanding how self-efficacy operates and affects patient well-being. But, is it possible to modify self-efficacy for the benefit of the patient?

Self-efficacy is derived from four sources of information for any specific behaviour: (a) enactive mastery experience; (b) vicarious experience; (c) verbal persuasion and (d) physiological or affective states (Bandura, 1977). Enactive mastery experience relates to the target behaviour being successfully performed. This would increase perceived efficacy levels whereas failing to perform the desired behaviour would reduce it. Vicarious experience, relates to imitating a behaviour after observing a person similar

to oneself successfully perform the behaviour in question and evaluating one's own performance on the basis of the performance observed. Verbal persuasion refers to others expressing faith in one's abilities to perform a specific behaviour. Finally, perceived self-efficacy can be increased through the reduction of negative emotional states and correction of misinterpretations of physical states.

Manipulation of these four sources of self-efficacy could theoretically lead to an increase in perceived self-efficacy. The evidence for effectiveness of interventions to enhance self-efficacy in abstaining from substance use was found to be more consistent compared to adopting HIV-related prevention behaviours (Hyde, Hankins, Deale, & Marteau, 2008; Mize, Robinson, Bockting, & Scheltema, 2002). The authors emphasized that only a small number of the studies included in the reviews assessed self-efficacy as an independent outcome and only Mize et al. (2002) synthesized their findings in a quantitative way.

Ashford, Edmunds, & French (2010) found a significant effect of physical activity interventions on self-efficacy. In addition, when vicarious experience and feedback on previous or other people's performance were included in the interventions, physical activity self-efficacy was significantly increased compared to when these techniques had not been incorporated. In contrast, when persuasion and graded mastery strategies as well as techniques to identify barriers were used as components in the interventions, a reduction in self-efficacy as compared to interventions that had not used them was found. The authors emphasized that there was a significant degree of heterogeneity as well as multiple moderators in their meta-analysis which could have affected their findings

Perceived self-efficacy is a concept that is of great interest in COPD because dyspnoea can lead to a reduction in patients' confidence in their ability to avoid breathlessness while engaging in specific activities. This is true even when the associated physical demands are minor. Thus, some patients with COPD may be reluctant to engage in daily activities despite being physically able to do so for fear of getting breathless (Wigal, Creer, & Kotses, 1991).

Scherer, Schmieder, & Shimmel (1998) found that a combination education and exercise training in a pulmonary rehabilitation programme administered to patients with COPD was more effective in improving long-term self-efficacy in patients with COPD in comparison to a programme that included education only. This effect was maintained for 6 months. Significant improvement in patients' self-efficacy scores was also

observed in the programmes that contained only the education component but disappeared at 6-month follow-up. These results were consistent with previous findings by Atkins, Kaplan, Timms, Reinsch, & Lofback (1984a) who had used interventions targeting cognitions and behaviour to improve self-efficacy.

In conclusion, there is evidence that self-efficacy can be modified with beneficial effects on patients' health-related behaviours but they need to be tailored according to the behaviour of interest and the particular characteristics of the patient population in question.

3.4.4 Self-efficacy in COPD

a. Self-efficacy and health outcomes

The impact of low self-efficacy is evident on physical symptoms such as increased dyspnoea in patients with COPD. Patients' beliefs in their abilities to perform the activities they enjoy without the experience of breathlessness are weakened (Scherer & Schmieder, 1997). An association between self-efficacy and quality of life was found and persisted even when adjusting for disease severity and duration as well as socio-economic status factors (McCathie, Spence, & Tate, 2002). This suggested that SES variables and severity of disease were not as important to QoL as patients' beliefs in their ability to engage in desired activities without experiencing breathlessness. If patients' perceived themselves unable to socialise or exercise without fear of becoming breathless and collapsing, they would probably not perform these actions even if they were perfectly capable of doing so without any negative effects. These results emphasized how important self-efficacy is in COPD and how it can affect patients' behaviours.

Further evidence for the lack of consistency between patients' perceived self-efficacy and their objective abilities comes from studies showing varying degrees of functional outcomes in COPD patients with similar levels of impairment. Higher self-efficacy was a key factor in improving self-management and long-term behaviour change and mediated pulmonary function and quality of life (Arnold, et al., 2005; Wigal, et al., 1991). Higher levels of self-efficacy were associated with a decrease in patients'

psychosocial functioning, increased physical activity and poorer quality of life (Bentsen, Wentzel-Larsen, Henriksen, Rokne, & Wahl, 2010). In addition, quality of life was related to self-efficacy, perceived difficulty in breathing and satisfaction of household income level (Jee, 2011). Kohler, Fish, & Greene (2002) also found that perceived self-efficacy for functional activities mediated the relationship between lung function and quality of life in COPD. Similar effects were reported for survival, engagement in physical activity (Kaplan, et al., 1994; Soicher, et al., 2012) and functional performance (Siela, 2012). In contrast, lower levels of self-efficacy were related to poorer self-management of disease in COPD patients (Warwick, Gallagher, Chenoweth, & Stein-Parbury, 2010). It appears, therefore, that the effect of self-efficacy is pervasive and can affect different domains and behaviours in patients with COPD.

b. Factors influencing self-efficacy in COPD

Illness-related education could influence self-efficacy in patients with COPD. An increase in illness-related education might lead to an increase in patients' self-efficacy through increasing their knowledge of their illness, for example, what to expect and what to do. Blackstock & Webster (2007) conducted a systematic review on the effects COPD-specific education on outcomes which included quality of life changes, physical and psychological functioning, self-efficacy and health care utilisation. COPD-specific education for self-management was associated with decreased health care utilisation in COPD. Fewer hospitalisation rates were observed in patients who had received the educational programmes in comparison to those who had not. Health care costs in relation to GP visits were also reduced. Blackstock and Webster (2007) suggested that self-management education could have led to an increase in patients' self-efficacy to handle exacerbations without requiring medical treatment. HRQOL was not associated with receiving the educational interventions. The authors attributed this to use of different measures and their varying sensitivity as well as insufficient sample sizes.

Implementation of self-management programmes in COPD has increased in the past few years (Effing, et al., 2007). These programmes vary in their content depending on the severity of COPD, co-morbidities, patients' self-efficacy levels and their access to health care. Their main aim involves teaching COPD patients the skills to follow treatment regimens which are disease-specific and aid behaviour change in order to

support patients in controlling their condition and improving their physical and mental status (Bourbeau, 2003). Adams et al. (2007) found that self-management was effective in reducing health care utilisation in COPD as long as it was part of a multiple-component programme.

Self-management can influence self-efficacy in COPD. Patients need to regulate their exercise and eating habits, they need to take their inhalers regularly and they need to quit smoking. All of these behaviours contribute to their quality of life. Stellefson, Tennant, & Chaney (2012) found a significant effect of self-management education on COPD patients' self-efficacy levels in their review. For long-term effects of self-management interventions, inconsistent evidence was reported attributed to differing methods and content used in education delivery (Carrieri-Kohlman et al., 2010; Davis, Carrieri-Kohlman, Janson, Gold, & Stulbarg, 2006; Kara & Asti, 2004). Despite variability in the components included in the interventions, they all related to the four sources of self-efficacy postulated by Bandura.

Medication adherence is important in COPD management and self-efficacy is amongst the factors influencing medication adherence in COPD (Bourbeau & Bartlett, 2008; Rand, 2005). COPD patients need to manage their disease and associated symptoms, for example breathing problems on their own. Cecere et al. (2012) investigated factors related to medication adherence (long-acting beta-agonists (LABA) and inhaled corticosteroids (ICS) in COPD. These factors included personal characteristics, confidence in medication effectiveness and self-efficacy. The patients who had higher levels of self-efficacy also showed higher adherence to LABA. Authors attributed this finding to improved adherence to LABA being associated with enhanced control of respiratory symptoms leading to higher levels of self-efficacy. Higher age and educational attainment and successful smoking cessation were also associated with higher likelihood of adherence to LABA. Contrasting evidence was reported by Khdour et al. (2012) who found that self-efficacy could account for a very small proportion fo the variance in medication adherence. Patients' beliefs regarding medication effectiveness and the presence of physical and mental co-morbidities were stronger predictors of medication adherence.

COPD-specific self-management programmes appear to be effective in some domains but this does not mean that patients would attend them. In their review, Effing et al. (2007) reported that 86% of COPD patients who had attended a self-management education programme completed it successfully. Drop-out rates were reported to range

between 0-30%. Sohanpal, Seale, & Taylor (2012) investigated the reasons for attendance and possible barriers as well as options for attendance improvement. Eagerness to learn about self-management, socialising with others with the same condition and altruism were motivating factors for COPD patients to attend a self-management programme. Barriers for attendance included poor health status or not sufficiently poor health status and practical, physical and psychological factors. Reasons for low attendance were denial of condition, fear of changing habits, lack of social support, feelings of guilt about smoking and the rigid nature of the programme such as its duration and length. Increasing patients' perceived self-efficacy i.e. reinforcing their faith in their ability to participate in self-management programmes, is important in improving health status in COPD.

c. Self-efficacy and Pulmonary Rehabilitation (PR)

Patients' perceived self-efficacy levels play a role in pulmonary rehabilitation attendance. Keating et al. (2011) found high rates of non-attendance which ranged from 8 to 50%. For PR completion, drop-out rates were between 20-40% (Fischer et al., 2009). Of the COPD patients who had received a referral by their GPs, 75% attended and completed PR (Fischer et al., 2009). Fischer et al. (2009) found that failure to complete not attend PR was due to medical or practical reasons such as time constraints and dissatisfaction of health care system. This suggested that increasing patients' belief in their ability to overcome practical barriers may decrease the likelihood of drop-out.

The social nature of PR programmes facilitates interpersonal interaction between COPD patients. Patients with a broader social network were found to have better functional status which was associated with improved mental status (Marino, Sirey, Raue, & Alexopoulos, 2008). Lower levels of self-efficacy in COPD patients regarding symptom management include increased depression and anxiety (McCathie et al., 2002; Dowson, Town, Frampton, & Mulder, 2004).

Garrod, Marshall, & Jones' (2008) study explored (a) differences in self-efficacy levels between COPD patients who completed PR and those who dropped out and (b) associations between self-efficacy and physical and psychological variables. No statistically significant difference in baseline self-efficacy scores in the two groups was

found. When scores were analysed after completion of PR, strong associations were found between self-efficacy and mastery, emotion and anxiety.

d. Measurement and assessment of self-efficacy

One of the most commonly used tools to measure self-efficacy is the Generalised Self-efficacy Scale (Schwarzer & Jerusalem, 1993; Schwarzer & Jerusalem, 2010). The GSE originally included 20 items but was then revised to a shorter 10-item version. The individual items of the scale and its scoring are discussed in Chapter Six. The full version of the scale is included in the appendices (Appendix D7). General self-efficacy rather than illness-specific self-efficacy was selected for the present research for two reasons: (a) a proxy for illness-specific self-efficacy was included in the form of mastery within the Chronic Respiratory Questionnaire which assessed QoL in COPD; and (b) the aim of the study was to examine whether lower SES was related to more impaired HCA and poorer QoL and whether self-efficacy mediated these relationships. SES was assumed to influence an individual's belief in their ability to cope with life demands as a whole and therefore general self-efficacy was a more suitable choice.

3.4.5 Conclusion

The relationship between higher self-efficacy levels and improved physical and psychological quality of life as well as greater health care utilisation in chronic illness and COPD has been supported in a number of studies. Moreover, there is support for self-efficacy mediating the relationship between SES and health outcomes. Self-efficacy can be modified resulting in beneficial effects on patient outcomes. Based on the evidence for the role of self-efficacy in HCA and QoL, the hypotheses employed in this study included this variable as a possible mediator in the relationship between SES and HCA and QoL in COPD.

3.5 Emotional well-being in chronic illness

3.5.1 The impact of illness, coping and social support

Physical illness can create feelings of distress, uncertainty and loss of control in an attempt to adjust to new circumstances, make lifestyle changes and manage unexpected challenges and threats such as symptoms and the course of the disease (Taylor & Aspinwall, 1993; Taylor, 1991). These adjustments are part of people's coping mechanisms which are active processes that involve the receipt and assimilation of information about their illness, managing emotions and changing behaviours (Guthrie & Nayak, 2012). In chronic illness, this process has to be repeated or re-appraised frequently as complications or new symptoms may emerge which can put further strain on a person's health status. A significant proportion of people with chronic conditions are affected by emotional and affective disorders due to the stress derived from their illness and their lack of success in adjusting to it. Not everybody with a chronic illness experiences the same amount of stress. A number of different factors can exert an influence on a person's response to the stress of a chronic illness such as the nature of the illness itself, demographic characteristics, coping strategies or social support. These factors are discussed in detail below.

The nature of the illness can include a variety of aspects ranging from the degree of debilitation an illness can cause, to whether its onset is gradual or sudden, whether it is fatal and progressive or non-life-threatening and stable (Pollin & Golant, 1994). A chronic illness diagnosis can create feelings of uncertainty regarding the future and one's physical status, possible lifestyle changes as well as a sense of vulnerability, distress and helplessness due to loss of personal control over the illness and life in general (Taylor, Helgeson, Reed, & Skokan, 2010). The impact of demographic characteristics is reflected in the fact that people who suffer from the same chronic illness can experience different manifestations such as severity and duration of symptoms depending on their age, gender, marital status, physical states, ethnicity or education (Bracht, 1980).

Coping strategies which are adopted by people to deal with a stressor that arises when facing a chronic illness can be influenced by different factors. One of them is the degree of controllability (Lazarus & Folkman, 1984). Controllability refers to the extent to which coping responses are effective at targeting the problem or ameliorating the

emotional impact of the problem. Coping strategies involve a cognitive and a behavioural component. The cognitive component aims to make sense of the illness and its impact on one's life as well as cope with emotional responses to an experience such as denial or minimalisation. The behavioural component involves actions that can be employed to change the situation such as increasing one's knowledge about the illness, learning to control symptoms and making short- and long-term plans (Sidell, 1997).

Social support offered by family and friends can also affect a patients' reaction to chronic illness. Family and friends can have either a positive or negative effect on a coping response (Papadopoulos, 1995). A review by Kriegsman, Penninx, & van Eijk, (1995) found that when elderly people perceived family support in a positive way, they were more likely to have a more favourable course of illness. Gallant (2003) identified a number of negative effects from social support behaviours from friends and family. These included nagging, denying the severity of the person's illness, poor dietary habits of the family that were not compatible with the patient's recommended dietary pattern, overreaction and tendency to treat the person as an invalid. Social support can also include the wider social environment. For instance, societal emphasis on diets and fitness provided positive support to patients with diabetes (Maclean, 1991).

3.5.2 Emotional well being in chronic illness

Depression and anxiety are the most common mental health problems in chronic illness (Katon, 2003). The presence of a chronic somatic illness confers higher risk of depression (Wilhelm, Mitchell, Slade, Brownhill, & Andrews, 2003). A review by Clarke & Currie (2009) indicated increased prevalence of depression in people with heart disease, stroke, diabetes, cancer and rheumatoid arthritis compared to the general population. For example, in patients with asthma prevalence of depression was twice that found in healthy populations (14.4% vs. 5.7%) (Goldney, Ruffin, Fisher, & Wilson, 2003), in cancer it was reported to be up to four times (Evans, et al., 2005; Rodin, et al., 2007) while post-stroke depression prevalence ranged from 5% to 44% (Turner-Stokes & Hassan, 2002) and persisted for 6 months. The relationship between depression and heart disease was more complex with rates being similar for different aspects of heart disease such as myocardial infarction (MI), coronary artery disease and heart failure (Katon, Lin, & Kroenke, 2007; Lane, Chong, & Lip, 2005). Pre-existing

depression ranged from 33% to 50%. In rheumatoid arthritis, prevalence of depression ranged from 13% to 80% with younger patients being more likely to be depressed and socially withdrawn (Keefe, et al., 2002). There appears to be substantial variability in the prevalence levels of depression and anxiety depending on the illness, its nature and manifestation.

Clarke and Currie (2009) found that various elements such as deterioration of disease, unrelieved pain, functional impairment and social isolation were linked to higher risk of depression. However, depression itself and especially co-morbid depression increased the risk for higher disease severity mainly due to non-adherence to the treatment regimen which was associated with longer hospital stays and higher morbidity and mortality. Depression was increased the risk of developing heart disease, stroke, diabetes or osteoporosis. Clarke and Currie's (2009) found great variability in the measures and decreased power in the studies they reviewed. Therefore, depression could not be established as an independent risk factor for these chronic physical illnesses and especially heart disease.

There is high prevalence of anxiety disorders in patients with heart disease (10%-50%) and cancer (up to 69% depending on disease progression) (Clarke and Currie, 2009). In childhood cancer survivors, a life prevalence of stress disorder ranged between 20.5% to 35% (Bruce, 2006). Great variability in the percentages describing the prevalence of depression and anxiety, heterogeneity in patient groups and the nature of the disease affecting participants warrant caution when interpreting results and drawing conclusions.

Depression and anxiety are key elements in chronic illness not only due to the additional burden placed on patients but also because they can impact other domains. For example, depression and anxiety can inhibit adjustment to symptoms such as pain (Katon, 2003) or lead to more intense experience of physical symptoms in patients with chronic illness (Ciechanowski, Sullivan, Jensen, Romano, & Summers, 2003; Ludman, et al., 2004) and higher mortality rates (Ciechanowski, et al., 2010). In addition depression and anxiety disorders in chronic physical illnesses can influence patients' quality of life and increase their levels of physical disability (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007; Sareen, Stein, Campell, Hassard, & Menec, 2005). Depression and anxiety have also been linked to poorer health care access as well as less effective communication with health professionals (Ciechanowski, Katon, Russo, & Walker, 2001).

Major depression had a negative impact on health behaviours such as smoking, healthy nutrition and lifestyle, adherence to medical treatment and physiologic consequences (Katon, 2003). Katon (2003) suggested that this could provide an explanation for the relationship between depression and increased rates on morbidity and mortality mainly for heart disease and diabetes. The literature provides significant evidence for the association of major depression with unhealthy behaviours such sedentary lifestyle, smoking and poor diet (Glassman et al., 1990; Goodman & Whitaker, 2002; Rosal et al., 2001). Higher non-attendance and drop-out rates in exercise rehabilitation attendance and completion were associated with higher depression scores in stroke patients (Morris, Raphael, & Robinson, 1992).

Self-management is important in optimising treatment outcomes and is affected significantly by major depression. Chronic illness management requires collaboration and good communication between patients and their doctors in a variety of domains such as dietary changes, increase of activity levels, regular intake of medications, monitoring physiological indices such as blood glucose levels and reducing unhealthy behaviours such as smoking or alcohol (Katon, 2003). Patients with COPD, for example, who may suffer from anxiety or depression would be less likely to communicate regularly with their doctor, engage in physical activity, adopt a healthy diet or adherence to their treatment regime compared to patients without anxiety or depression.

Adherence to the treatment regime is a further component of self-management. A meta-analysis by DiMatteo, Lepper, & Croghan (2000) suggested that depression tripled the likelihood of non-adherence to medical treatment in chronic illness patients. The same adverse effects of depression were found for decreased adherence to diet and refills of medications in diabetic patients (Ciechanowski, Katon, & Russo, 2000) and heart disease patients (Carney, et al., 1995) as well as lower success rates in smoking cessation (Anda et al., 1990).

The effect of depression on self-management of chronic illness appears to be better supported than that of anxiety. Lester, Stepleman, & Hughes (2007) found an association between depression and self-reported cognitive impairment and illness self-management in patients with multiple sclerosis (MS). Anxiety was related to severity of physical limitations and self-reported cognitive impairment but not to disease self-management. The authors attributed this finding to possible variations in the role of depression and anxiety in different processes in MS patients. Similarly, Bauer et al.,

(2012) found that when depression improved in cardiac patients it was independently related to better self-reported adherence to treatment and health behaviours but there was no effect on these behaviours when anxiety improved. In other chronic illnesses such as COPD, anxiety appears to play a more significant role in self-management which will be discussed in the following section.

The findings discussed above underline the extent of the influence of psychological well-being on QoL domains as well as its interaction with other psychosocial variables not only in chronic illness but also in healthy populations.

3.5.3 Emotional well-being in COPD

Prevalence of depression can reach 75% for anxiety and 80% for depression in COPD (Maurer et al., 2008; Yohannes, Willgoss, Baldwin, & Connolly, 2010). Apart from placing an additional burden on COPD patients' psychological well-being, depression and anxiety were also associated with poorer prognosis, and quality of life, increased symptoms experience, decreased health care utilisation and higher mortality (de Voogd et al., 2009; Hill, Geist, Goldstein, & Lacasse, 2008; Ng et al., 2007). Laurin, Moullec, Bacon, & Lavoie (2012) reviewed the literature and concluded that there was an elevated risk for exacerbations in COPD patients with anxiety and/or depression. However, the authors emphasized that the relationship between these factors is complex because of the influence of a number of COPD-related factors such as clinical presentation, biological and physiological processes as well as and patient-related outcomes.

The effects of depression and anxiety on health outcomes in COPD seem to be not of temporary nature but are rather pervasive and relatively persistent. For example, von Leupoldt, Taube, Lehmann, Fritzsche, & Magnussen (2011) found a positive effect of PR on patients' physical and mental functioning and QoL including a reduction in depression and anxiety. However, it was also observed that depression and anxiety were associated with poorer outcomes such as greater dyspnoea and decreased physical and mental QoL pre- and post-PR, even when adjusting for confounders. The fact that controlling for possible confounding variables did not change the significance of the association between depression and anxiety on outcomes indicated that their influence was pervasive and persistent. However, whereas anxiety was associated with

greater dyspnoea at rest, depression was related to poorer physical functioning as assessed in the 6-minute walk test. Von Leupoldt et al. (2011) stressed the negative and stable influence of depression and anxiety on COPD patients' physical and mental QoL even when improvements in these domains have been achieved. These findings echoed previous studies which had found associations between depression and anxiety and poorer disease course, physical functioning, quality of life and increased dyspnoea (Eisner, et al., 2010; Giardino, et al., 2010; Ng et al., 2007).

Self-management is very important in COPD. A number of factors can influence self-management in COPD including anxiety, depression, hopelessness and optimism (Cicutto, Brooks, & Henderson, 2004; Simpson & Rocker, 2008) but not in a linear or simple fashion. Anxiety can have both a positive and negative influence on COPD self-management. On the one hand, it can provide patients with the motivation to engage in behaviours that can control their symptoms and prevent deterioration of their condition. Anxiety can lead to decreased self-confidence to manage a chronic illness (Dowson et al., 2004) because of fear of breathlessness. Patients fear that if they engage in physical or other management activities, they might experience significant breathlessness which would in more anxiety (Bailey, 2004). This was not limited to self-management and physical activity processes but also pertained to everyday activities such as personal care, household chores or socialising (Yohannes, 2008; Dowson et al., 2004; Simpson and Rocker, 2008). Avoidance of these activities may lead to social isolation, lack of social support and increased dependency on other people which would increase feelings of depression and anxiety and decrease physical and mental quality of life (Bailey, 2004; Cicutto et al., 2004; Simpson and Rocker, 2008). Therefore, identifying the fine line between beneficial and harmful levels of anxiety as well as maintaining them at an optimal point should be considered when exploring the effect of psychological variables on patients with COPD.

Depression can reduce patients' motivation to engage in various activities such as self-management or socialising (Cicutto et al., 2004; Dowson et al., 2004; Simpson and Rocker, 2008). As a result, their physical, social and emotional status can deteriorate due to lack or reduction of self-management activities (Cicutto et al., 2004; Dowson et al., 2004; Simpson and Rocker, 2008). Adverse effects of depression have been reported for quality of life as well (Carrieri-Kohlman et al., 2005; Simpson and Rocker, 2008). The significant effects of depression and anxiety on COPD patients' quality of life, exacerbations and self-management behaviours, make it imperative to address them in order to improve patients' well-being. Factors such as hope and optimism as

well as increased perceived control and self-efficacy were found to be key variables that could contribute in sustaining and improving patient's psychological well-being despite the adverse effects caused by the illness (Alberto & Joyner, 2008; Bourbeau, et al., 2004; Cicutto et al., 2004). Therefore, depression and anxiety need to be included in interventions which aim to improve COPD patients' QoL for two reasons: (a) additional benefits in patients' QoL could be achieved and (b) benefits could be maintained in the long-term.

a. How do depression and anxiety influence patients' physical status?

Two theories have been outlined based on a review of studies examining depression and anxiety in relation to disability (Lenze, et al., 2001). The first theory postulated that depression or anxiety themselves were disabling states. For instance, depression is associated with executive-type cognitive impairments such as attention, planning, behaviour which could explain greater disability. This would mainly affect instrumental activities of daily living (IADLs) such as cooking, cleaning or paying bills, i.e. basic tasks required for independent living. Despite appearing as "physical" tasks they incorporate a "mental" component as well. Alexopoulos, Vrontou, Kakuma, & Meyers (1996) found a relationship between initiation-perseveration impairment and higher global disability. Another pathway of influence can be that of poor appetite which is related to depression and has been associated with disability due to decreased body mass index (Galanos, Pieper, Cornoni-Huntley, & Bales, 1994).

The second theory suggested that depression or anxiety could lead to a greater degree of disability in a person with other physical illnesses either through the increase of risk factors for these illnesses or through the adoption of poorer health behaviours in individuals who are suffering from both physical illness and depression. Physical disability has been associated with higher risk of depression mainly due to the fact that the emergence of disability leads to loss of perceived control and decreased self-esteem (Schulz, Heckhausen, & O'Brien, 1994). This could lead to decreased social support and increased isolation due to the physical restrictions of engaging in desired social and leisure activities (Schulz, et al., 2000) which could increase the risk of depressive and anxiety symptoms. Brenes, et al. (2008) found a relationship between poorer levels of physical functioning and symptoms of depression and anxiety

throughout all ages. However, the cross-sectional design of the studies prevented conclusions about causality. The various pathways through which depression could influence an individual's degree of physical disability are presented in Figure 3.3.

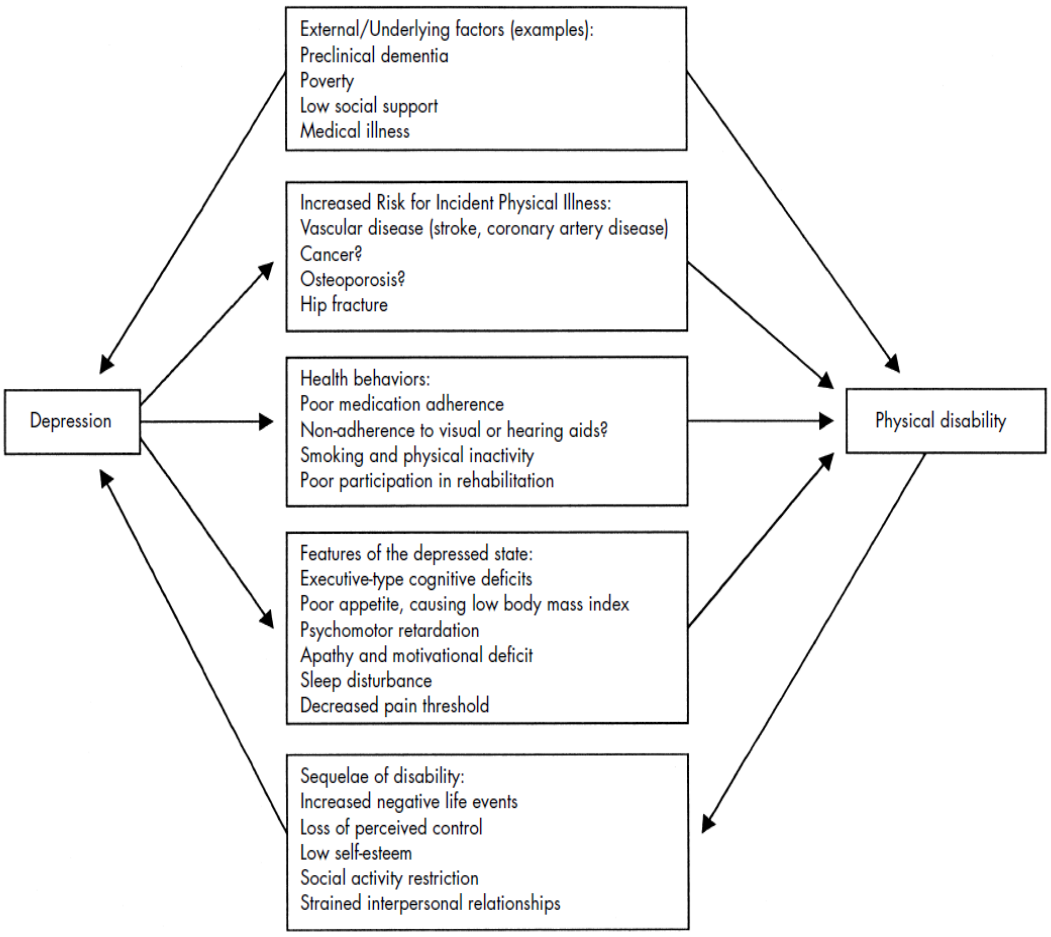


Figure 3.3 Model of depression and disability (taken from Lenze et al., 2001)

A vital component of the relationship between depression and QoL is how people perceive their illness. This can influence how they will make sense of and respond to it. The following section will discuss the proposed mechanisms through which depression and anxiety could influence symptom perception.

a. The relationship between depression, anxiety and symptom perception

Severity of a physical illness could be associated with severity of depression and anxiety. However, in their review, Katon et al. (2007) found that patients with a chronic illness who also suffered from depression and anxiety reported more symptoms compared with patients who were suffering from a physical medical condition alone when severity of disease was controlled for. Katon et al. (2007) examined four different types of illnesses diabetes, pulmonary disease, heart disease and arthritis. They found equally strong associations between depression and anxiety and physical symptoms such as pain and objective physiological measures indicative of disease severity and depression and anxiety. The authors drew attention to bidirectional effects between depression and anxiety and severity of illness provided in the literature (Katon, 2003) described above. Symptom perception, regardless of disease severity, was examined in younger adults and adolescents with similar findings (Richardson, et al., 2006). Youth who had anxiety or depressive disorder were significantly more likely to report more days of experiencing asthma-related symptoms in the previous two weeks as compared to healthy young people. Moreover, the number of asthma-related symptoms was strongly related to the number of anxiety and depressive symptoms. This suggested that young people with more symptoms of depression and anxiety were more likely to report a greater symptom burden for their asthma.

It appears that co-morbid depression and/or anxiety influences disease-related symptom perception more strongly than the severity of the physical illness. The nature of this influence can be explained by the symptom perception hypothesis (Costa & McCrae, 1987; Watson & Pennebaker, 1989) which posits that the general predisposition for frequent experience of a variety of negative emotions, for example neuroticism or trait negative affectivity, is associated with increased reporting of somatic symptoms. Depression and anxiety follow a different mode of operation in relation to potentially threatening stimuli as compared to neuroticism and trait negative affectivity. For example, in the context of illness threat, it is more likely that anxiety symptoms will precede symptoms of depression than the opposite, i.e. depression preceding anxiety symptoms (Alloy, Kelly, Mineka, & Clements, 1990; Mineka, Watson, & Clark, 1998; Mogg & Bradley, 1998).

But how could depression and anxiety influence the ways people perceived their illness and symptoms? The main cognitive characteristic of anxiety is hypervigilance when

responding to potentially harmful stimuli. Mineka et al. (1998) found that people high in anxiety pay more attention to danger cues when tested in conditions of conscious and unconscious awareness as compared to people low in anxiety. Hypervigilance makes them react quicker to negative stimuli such as visual or verbal cues that convey threat, pain or danger (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007; Mogg, Kentish, & Bradley, 1993). Furthermore, the literature supports a relationship between neuroticism/trait anxiety and higher propensity of exaggerating the frequency and physical symptoms experienced. People who exhibit high levels of neuroticism or trait anxiety were more likely to report more symptoms such as pain, gastrointestinal complaints and aches (Williams & Wiebe, 2000; Costa & McCrae, 1987; Watson & Pennebaker, 1989). This was also true when no objective physical illness was present (Costa & McCrae, 1987; Watson & Pennebaker, 1989).

In contrast, individuals who experience severe symptoms of depression or have been diagnosed with depression, do not show high levels of vigilance (Yovel & Mineka, 2005). These individuals process cognitive-affective information in a different way which involves self-focus and rumination (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008; Williams & Wiebe, 2000). This evidence confirms Pennebaker's theory (1982) who suggested a model to explain symptom perception based on competition of cues. The theory (Pennebaker, 1982) postulates that people are more attentive to physical changes when their environment lacks interesting stimuli which act as distractors from the symptoms they are experiencing. When people are feeling melancholic, they become completely absorbed in their internal worries. This exaggerated engagement in self-focus and rumination results in greater recall of discomforting experiences (Mineka et al., 1998). For instance, people with moderate to severe depressive symptoms or clinical depression were found to remember a greater amount of negative information relating to themselves compared to positive information (Mineka & Nugent, 1995). In contrast, people who experience high anxiety do not appear to exhibit this recall bias (Coles & Heimberg, 2002; Mineka & Nugent, 1995).

Recently a revised symptom perception hypothesis was proposed by Howren & Suls (2011). This revised version assigned roles for specific emotions within the symptom perception process. The revised symptom perception theory suggested that anxiety and depressive emotions act at varying stages of the symptom perception and recall process. This means that depressive emotions, which involve intense self-focus and rumination, can lead to an exaggeration of somatic symptoms experienced in the past. Feelings of anxiety, on the other hand, which involve increased attentional alertness,

result in greater reporting of symptoms experienced at the current moment of reporting (Howren & Suls, 2011).

A theoretical model that included illness perceptions and health care utilisation was developed by Katon (2003) (see Figure 3.4). The model includes factors associated with higher risk of depression and anxiety such as genetic susceptibility, adverse childhood events and stressful life events.

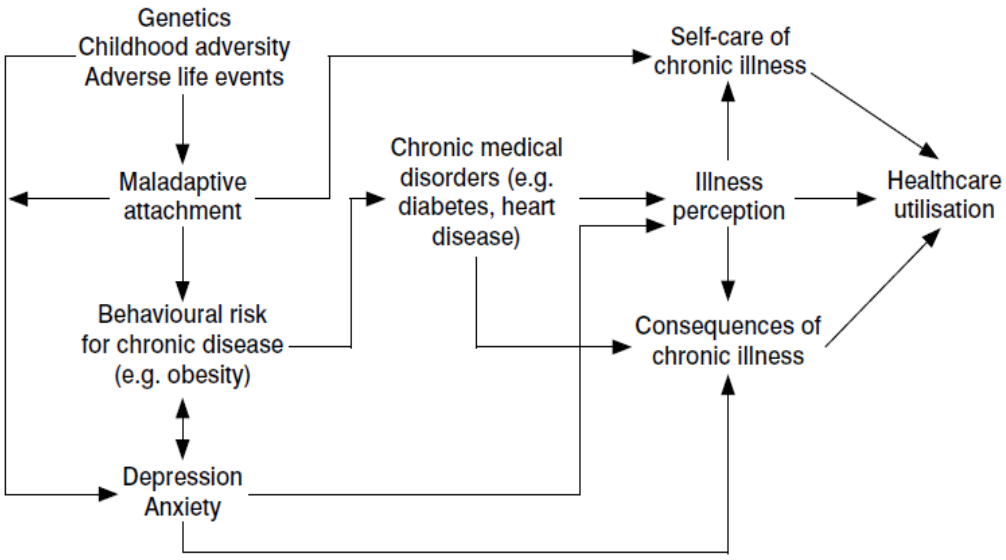


Figure 3.4 A theoretical model depicting the interactions between anxiety, depression, physical illness and healthcare utilisation (Guthrie & Nayak, 2012, adapted from Katon, 2003).

The relationship and pathways of possible interaction between socio-economic status and poorer psychological and physical well-being was discussed in Chapter Two. In their systematic review, Gallo and Matthews (2003) proposed a theoretical framework to understand how SES, negative emotions and cognitions and health interact. The authors suggested that more socio-economically deprived environments lead to higher levels of stress and a reduction in people's reserve capacity such as financial and material resources and social support to manage stressful events. This, in turn, increases their vulnerability to experience negative emotions and cognitions especially hostility and depression (see Figure 3.5).

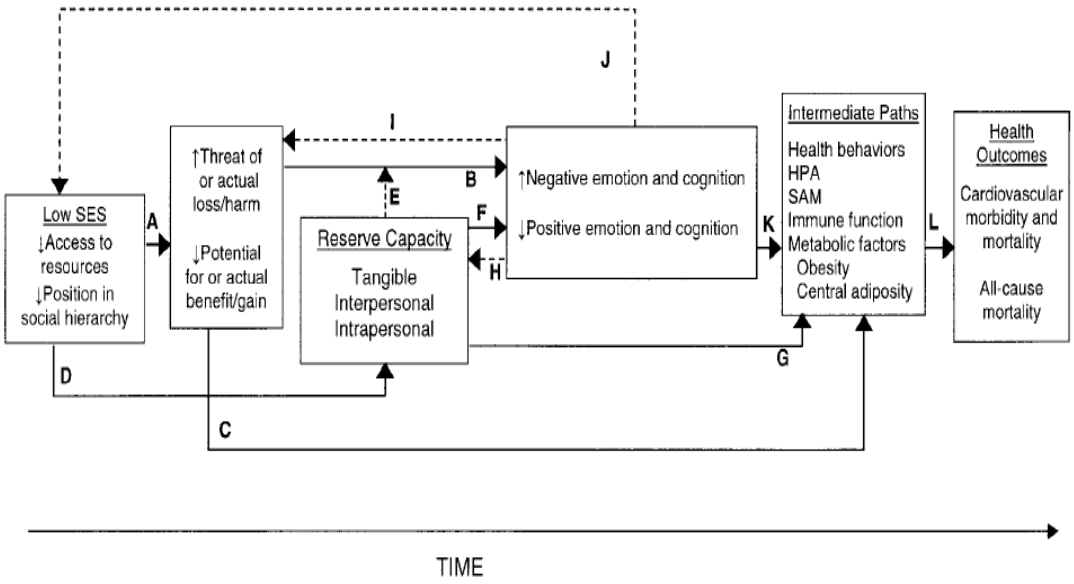


Figure 3.5 A general framework presenting the psychosocial pathways of interaction between SES, negative emotions and cognitions and health outcomes (Gallo & Matthews, 2003)

Adopting a psychosocial perspective, Gallo and Matthews (2003) maintained that the primary step linking SES with negative emotions and attitudes is the increased frequency and intensity of exposure to stressful events and dangerous conditions. Lower SES was associated with greater exposure to more frequent stressful and negative situations (Dohrenwend, 1973; McLeod & Kessler, 1990; Murrell & Norris, 1991; Stansfeld, Bosma, Hemingway, & Marmot, 1998). These stressful experiences are interpreted in a more negative way under the influence of low SES (Chen & Matthews, 2001). As a result, exposure to negative and stressful situations takes its toll on people's emotional status (Ensel & Lin, 1991) and also directly affects health outcomes (McEwen & Stellar, 1993). In both models described above Guthrie & Nayak (2012) and Gallo & Matthews (2003) the mechanisms proposed include the cognitive and emotional interpretation and experience which can mediate and affect health outcomes. Illness perceptions could contribute in explaining this link between SES and health outcome within its bi-level-processing theory.

3.5.4. The relationship between depression and anxiety and illness perceptions

The Common Sense Model (CSM) (Leventhal et al., 1980) provided a framework to explain the relationship between illness outcomes and anxiety and depression. Disease activity can influence how an individual perceives their condition. These perceptions can have an impact on psychological status such as depression and anxiety. Feelings of anxiety and depression can, in turn, influence patients' coping strategies, for example, lead to avoidance behaviours or encourage/discourage help-seeking from friends and family. These stages follow a feedback loop in which coping styles, behaviours, emotions and cognitions can be appraised and updated accordingly.

Knowles, Wilson, Connell, & Kamm (2011) found that disease severity exerted a direct influence on illness perceptions in patients with Crohn's Disease. Furthermore, illness perceptions directly influenced depression and anxiety which were linked to emotional coping responses used by patients. This effect remained when disease severity was adjusted and explained a significant proportion of the variance in depression and anxiety (Knowles et al., 2011). This was indicative of the strong role of illness perceptions in the association between depression and anxiety and quality of life. Knowles et al. (2011) developed their own model to describe this interaction which was adapted from Hagger & Orbell's (2003) (Figure 3.6).

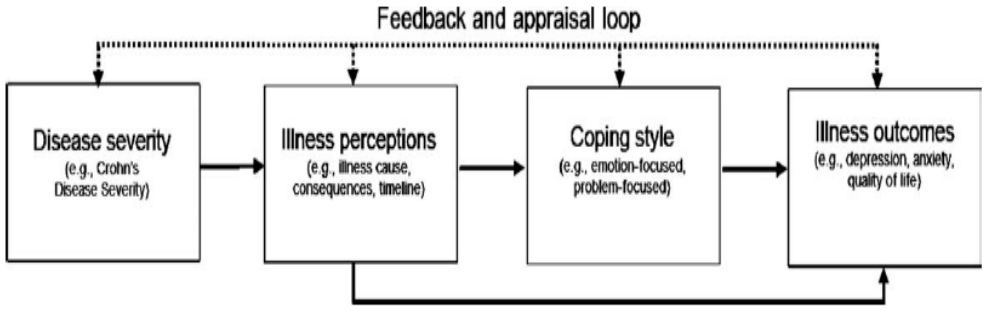


Figure 3.6 Knowles et al.'s (2011) model to examine the interrelationship between disease severity, illness perceptions, coping strategies and health outcomes (adapted from Hagger & Orbell, 2003)

A relationship between disease severity and depression and anxiety had previously been reported by Hagger & Orbell (2003) as well as between illness perceptions and depression and anxiety and quality of life (Kiebles, Doerfler, & Keefer, 2010; Hagger & Orbell, 2003; Rutter & Rutter, 2002; Scharloo et al., 1998). For instance, (Hagger & Orbell (2003) found a significant correlation between illness perceptions and coping strategies as well as psychological morbidity. This was suggested by findings which showed that poorer psychological functioning was associated with disease state – as assessed by objective measures of illness status – and negative illness perceptions.

Murphy et al. (1999) found that illness perceptions were significantly associated with depression and anxiety in rheumatoid arthritis (RA) patients when controlling for disease severity. The strongest dimensions of illness perceptions associated with depression and anxiety were consequences and control/cure. The more severe the impact of disease and the lower the levels of control were, the higher the levels of depression and anxiety. These findings added to our knowledge of associations between the dimensions of perceived consequences and the degree of control/cure individuals feel they have over their illness in a variety of medical conditions (Hagger & Orbell, 2003; Groarke et al., 2005; Schiaffino et al., 1998; Rutter & Rutter, 2002; McCorry et al., 2012; LeGrande et al., 2012; Skinner et al., 2011). Evidence on how depression and anxiety may be associated with these factors can contribute to increasing our understanding of the mechanisms that may underlie these associations.

Illness perceptions have a significant impact on self-management in patients with COPD (Dowson et al., 2004). Patients' perceptions of negative consequences or low perceived control over their illness were associated with decreased motivation to engage in activities thus preventing improvement in their well-being. This, in turn, inhibited their perceived ability to manage their conditions effectively and experience positive outcomes (Dowson et al., 2004; Kaptein et al., 2008). Patients who felt they could achieve a positive influence on their condition experienced stronger motivation to manage their COPD and greater self-confidence in their ability to engage in self-management processes (Clark et al., 2009; Dowson et al., 2004; Kaptein et al., 2008). These findings emphasize not only the role of depression and anxiety in relation to various domains of QoL in patients with COPD but suggest the role of additional factors that may interacting and influence a patients' adjustment to the illness, their coping styles and self-management strategies.

3.5.5 Conclusion

The evidence provided in this section emphasises the roles of depression and anxiety in chronic illness and especially in COPD. Both variables are key elements in the relationship between quality of life and self-management processes as well as health care utilisation, exacerbations and medication adherence. The effects of depression and anxiety on quality of life, coping and self-management in COPD may have different pathways of influence and may be associated with different outcomes but they are appear to be pervasive. In the present study, depression and anxiety were examined as components of COPD patients' QoL.

3.6 The role and contribution of health psychology in COPD

A variety of psychological factors such as illness perceptions, self-efficacy and emotional well-being in COPD were discussed earlier in this chapter and their associations with patients' health care access as well as physical status and quality of life were described. The role and contribution of health psychology in identifying and addressing issues of patient experience of COPD and the ways of adjusting and coping with the illness is widespread and significant both in the field of research and also clinical practice. An overview of the methods applied and the types of interventions implemented in health psychology to assess and address various aspects of the psychosocial and physical impact of COPD on patients is provided in the following sections.

3.6.1 Health psychology diagnostics in COPD

A variety of diagnostic tools are employed by health psychology researchers in order to assess and design interventions to address issues such as identification of mechanisms that influence long-term health and well-being in patients with chronic illness including functional status, recovery and return to work, coping with their illness, wound healing and quality of life (Taylor, 2008).

In COPD, patients are faced with a variety of physical limitations due to the disease such as dyspnoea, decreased mobility, co-morbidities, reduced daily activities and quality of life (Bossenbroek, de Greef, Wempe, Krijnen, & ten Hacken, 2011; Decramer, et al., 2011). However, while the physical impact of COPD on patients is very important, the psychological influence of the disease is equally important. A number of psychological factors can affect quality of life, coping, self-management and daily activities in COPD such as illness perceptions, anxiety and depression, adjustment and coping with the illness (de Ridder, Geenen, Kuijer, & van Middendorp, 2008; Disler, Gallagher, & Davidson, 2012; Hynninen, Breitve, Wiborg, Pallesen, & Nordhus, 2005; McCathie, Spence, & Tate, 2002).

In addition to assessment of patients' psychological status, health psychology also focuses on elucidating the association between psychological and physical health and the ways they interact and affect each other. For instance, Weldam, Lammers, Decates, & Schuurmans (2013) found that more positive illness perceptions and reduced depressive symptoms were associated with better health-related quality of life. No associations were found between psychological factors and reduced daily activities and between proactive coping and reduced daily activities and HRQOL possibly due to a small sample size and the fact that participants had mild COPD. These finding are consistent with previous studies that provided evidence for the relationship between more positive illness perceptions and better HRQOL as well as enhanced treatment outcomes such as baseline six-minute walk (6-MW) test performance and response to treatment for patients with mild to moderate COPD (Fischer, et al., 2012; Scharloo, et al., 2007).

Psychological morbidity especially anxiety and depression are common amongst COPD patients. A meta-analysis reported a prevalence of 36% for anxiety and 40% for depression in COPD (Yohannes, Baldwin, & Connolly, 2000). A recent review found increased levels of anxiety and depression in COPD patients which were associated with a significantly worse disease course (von Leupoldt & Kenn, 2013). While the exact causes for anxiety and depression in COPD patients are not known, they could be linked to the burden of the disease, functional limitations, social isolation, or the knowledge of having a serious and usually progressive disease (von Leupoldt & Kenn, 2013). The findings of the review emphasised the increased frequency of lack of detection and inadequate treatment of anxiety and depression in COPD patients – both through pharmacological treatment and psychotherapeutic approaches – stressing the need for future quality studies (von Leupoldt & Kenn, 2013)

Patient experience of living with COPD contributes to increasing understanding on adjustment and coping with the disease. Cooney, et al. (2012) identified “co-existing with COPD” as a core category which consisted of three sub-categories: (a) controlled co-existence; (b) strained co-existence and (c) uncontrolled co-existence depending on the degree of control and living to the optimum that the patient perceived themselves to be experiencing. The degree of control over COPD is also reflected in one’s self-efficacy. Self-efficacy is a person’s belief of his ability to achieve a set target or goal (Bandura, 1986). In the case of chronic illness, and in this case COPD, self-efficacy reflects the extent to which patients perceive themselves able to adjust and cope with COPD, for example, engaging in self-monitoring and self-management of their condition. Higher self-efficacy following pulmonary rehabilitation in COPD patients was a predictor of decreased psychosocial impact of disease, increased physical activity and health status and improved quality of life (Bentsen, et al., 2010). The role of self-efficacy in COPD is described in detail in previous sections of Chapter Three.

Different coping styles such as confronting or passive reaction coping styles are adopted by COPD patients and are associated with different outcomes. For example, patients with symptoms of depression reported decreased use of active confronting, higher use of avoidance strategies and passive reaction pattern coping styles. Patients with symptoms of depression reported lower levels of seeking social support coping compared to patients without symptoms of depression (Stoilkova, Wouters, Spruit, Franssen, & Janssen, 2013). Stoilkova et al. (2013) concluded that different coping styles were related to symptoms of anxiety, depression and exercise intolerance but not COPD-specific health status in patients entering pulmonary rehabilitation.

3.6.2 Health psychology interventions in COPD

Behavioural research within the scope of health psychology in COPD has been extensive in the past 50 years exploring a variety of health-related aspects such as psychoanalysis, psychosomatics, neuropsychology, quality of life, psycho-maintenance, patient education, coping and illness cognitions, self-management and collaborative care (Kaptein, et al., 2009). A review by Kaptein et al. (2009) included research focused on the aforementioned areas and emphasised the importance of the patient being the key in managing their illness effectively which is, in turn, associated with beneficial outcomes including decreased rates of hospital admissions, higher

exercise performance and improved quality of life. The authors suggested that self-management as well as patient perceptions of their condition should be integrated into the treatment regimen administered to patients in order to enhance physical and emotional outcomes in patients with COPD. For example, Rosser et al. (1983) showed that formal psychotherapy was not as effective as interpersonal support in patients with COPD in improving their quality of life e.g. reducing their dyspnea. Other studies associated personality and psychological characteristics such as anxiety, depression, personality disorders, panic and/or fear and self-esteem with COPD-related physical symptoms as reported in a review by Hynninen et al. (2005). Cognitive impairment and neuropsychological deficits were also linked to physical and emotional status in patients with COPD (Prigatano, Parsons, Levin, Wright, & Hawryluk, 1983; Zielinski, 1999). The importance of the role of patient perception in relation to their physical well-being is also reflected in research findings showing that quality of life – which is a subjective experience reported by the patient – is only weakly associated with pulmonary function and disease severity in COPD (Domingo-Salvany, et al., 2002). Differences in individual perceptions of their physical status held by COPD patients can also influence their coping strategies independent of objective COPD characteristics as well as self-management and collaborative care (Kaptein et al., 2009). These perceptions are based on how patients interpret and experience their symptoms and their impact on their daily life (Kaptein et al., 2009). A variety of factors can influence patients' perceptions of their status such as previous illness experience, personality characteristics, illness cognitions and beliefs as well as influences derived from their social and cultural background. Examination of patients' illness perceptions and cognitions might help elucidate the reasons behind the differences in their managing and coping with their COPD despite having identical objective disease severity (Kaptein et al., 2009). The way patients make sense of their symptoms is central in the process of coping and can be a better predictor of objective measures of disease severity, for example, when examining visits to out-patient departments (Scharloo, et al., 2000). Kaptein et al. outlined the way in which interventions aimed at COPD patients evolved through the years from psychotherapy and patient information to education about identification of early signs of an exacerbation and discussing the impact of COPD with partners. The authors drew attention to the fact that health care professionals should listen to their patients in order to increase their understanding of their illness experience which would supplement and maximise their treatment effectiveness. In addition, Kaptein et al. (2009) emphasized the need to focus on COPD patients' partners in enhancing self-management as well as to explore reasons

why health care professionals have difficulty in adhering to guidelines for diagnosing and treating COPD patients and why COPD is viewed as less attractive compared to other illnesses such as cancer.

Evidence for the effectiveness and important of health psychology interventions focusing on different outcomes in COPD patients was provided by a number of systematic reviews. For instance, Dickens et al. (2013) found that complex interventions especially those employing general education, exercise, and relaxation therapy significantly decreased the likelihood of urgent healthcare utilisation in patients with COPD. Similarly, Coventry, et al. (2013) reviewed 29 randomised controlled trials of psychological and/or lifestyle interventions for COPD patients and found associations with a decrease in depression and anxiety symptoms. The component showing the strongest effects was multi-component exercise training independent of the severity of depression or anxiety symptoms. Pires-Yfantouda, Absalom, & Clemens (2013) reviewed effectiveness of interventions aimed at smoking cessation in COPD patients. The review findings indicated that those interventions that included a combination of psychosocial elements and pharmacotherapy were effective in stopping smoking at 12 month follow-up. Difficulty in preventing attrition at community-based locations compared to acute or research settings was also highlighted by the authors. Cognitive-behavioural approaches that included various elements such as exercise, music, yoga, self-management education, breathing exercises were associated to improved dyspnoea and decreased COPD-related distress (Norweg & Collins, 2013). However, treatment effects for the different elements varied from small to large and the authors emphasised the fact that more research is required to increase effectiveness and availability of interventions for patients with COPD.

The evidence on the methods and efficacy of assessment and interventions implemented for patients with COPD is suggestive of the collaborative nature of health care services and health care professionals that is required for these patients. Collaboration in medical management of COPD patients would involve four principles: (a) the acquisition and development of self-management skills which would be supported by the equivalent behaviour; (b) motivation and self-efficacy which are essential elements in self-management; (c) the influence of the social environment; and (d) adaptation to chronic illness which is facilitated and enhanced by self-monitoring changes in health status and symptoms and taking appropriate action (Von Korff, Gruman, Schaefer, Curry, & Wagner, 1997).

- Conclusion

Behavioural research in COPD in the past few decades has drawn attention to the importance of patient empowerment, self-management and collaborative care in a variety of health outcomes. Assessment and identification of psychosocial issues deriving from COPD is important due to their interaction with patients' physical status and quality of life. The need for research and interventions to address elements from the psychological, social and biological domains in order to increase understanding into the mechanism underlying these processes and to maximise effectiveness of interventions aiming to improve patients' quality of life and coping with COPD is highlighted.

3.7 Overall conclusion

The evidence provided in Chapters Two and Three on the relationship between SES and HCA as well as SES and QoL indicated that higher level of financial and social deprivation was linked to both more impaired HCA and poorer QoL in a range of chronic illnesses. The first aim of this thesis was to explore whether this was true for COPD.

The review of the literature revealed conflicting findings on the relationship between SES and HCA and SES and QoL in chronic illness and in COPD Taken together the evidence suggested that SES factors do play an important role in HCA and QoL in chronic illness and COPD but can only account for a proportion of the variance for these outcomes. This raised the question of whether additional factors might be implicated in the association between SES and HCA and SES and QoL such as psychological variables. Illness perceptions and self-efficacy were considered due to the evidence for their involvement in HCA and QoL as well as their relationship with SES. Psychological variables might be influenced by a person's socio-economic position i.e. higher deprivation – possibly due to restricted availability of essential resources – might increase the likelihood of patients having more negative perceptions of their disease and lower beliefs in their abilities to engage in certain behaviours that would provide them with the treatments they needed and improve their QoL. Thus,

lower SES might influence the way a person would perceive, experience and manage their disease. These processes are likely to be influential in the integration of a person's experience and response to the disease in terms of lifestyle adjustments and adjustments to cope with the disability induced by the disease, their perception of their capacity to undertake activities, their perceptions of the impact of the disease on everyday life as well as how they seek and use treatment. This was the second aim of this thesis; to examine whether illness perceptions and self-efficacy mediated the relationship between SES and HCA and SES and QoL in COPD.

Illness perceptions and self-efficacy can be assessed with the use of reliable and valid instruments and can also be modified with appropriate interventions. Therefore, the findings of this research study could: (a) elucidate the pathways through which SES might be influencing the way patients seek health care services and managing their condition in COPD and (b) inform the design and implementation of targeted interventions to improve HCA and QoL in patients with COPD.

Chapter 4

Systematic review: “Socioeconomic status, quality of life and health care access in COPD”

4.1 Abstract

Background: Health inequalities are associated with worse access to health care potentially compromising quality of life. For Chronic Obstructive Pulmonary Disease (COPD), in particular, socio-economic status is associated with increased prevalence, mortality and exacerbation rates. This systematic review was conducted to assess the influence of socio-economic status (SES) on (a) healthcare access (HCA) and (b) quality of life (QoL) in patients with COPD.

Methods: A systematic search of published scientific literature was undertaken using standard bibliographic databases. Inclusion criteria for the studies were: (1) participants with a diagnosis of COPD based on spirometry assessment; (2) participants aged 18 years or over; (3) quantitative research studies; (4) articles published in the English language; and (5) studies reporting associations between SES and HCA and/or SES and QoL.

Results: 76 studies were reviewed in full. 14 were included in the analysis. The relationship between SES and HCA was examined in six studies and the relationship between SES and QoL was examined in eight studies. Lower SES in terms of income level and education was associated with better access to health care services which included greater likelihood of discussion about prognosis, higher medication uptake and adherence in three studies examining HCA. Higher SES in terms of income level, educational attainment and socio-economic indices was associated with greater HCA which included higher likelihood of receiving a diagnosis of airways obstruction and chronic bronchitis, lower risk of hospital admission and better access to primary health care services in the remaining three studies on HCA.

Lower SES was associated with poorer QoL in five studies. Lower educational attainment was related to greater dyspnoea, more respiratory symptoms, poorer QoL,

mental health and physical function. Higher SES was related to better QoL. No evidence to support the relationship between SES and QoL was found in three studies. In order to examine whether disease severity was a potential confounder in the relationship between SES and QoL, studies that had adjusted for severity of disease were examined separately. In the three studies that had adjusted for disease severity quality of life did show significant differences compared with the studies that had not adjusted for it.

Conclusion: Opposing outcomes were found in the relationship between SES and HCA in COPD in the literature that was reviewed. One of the reasons could have been that the primary aim of these studies was not to examine the relationship between SES and HCA and QoL in COPD. Instead, they focused on exploring other associations e.g. ethnic differences in emergency care for COPD patients or the extent of inhaler variation in patients with COPD. Thus, not all indices of SES (income, education, occupation) were measured in these studies. Associations between demographic variables such as SES and outcome measures were conducted as part of their analyses and therefore conceptualisation and/or measurement of SES might not have been as comprehensive as in other studies which focused specifically on examining the relationship between SES and HCA or QoL. There was significant heterogeneity in the populations examined and in the conceptualisation of measures which complicated comparisons across groups. Different studies showed opposing findings with respect to the relationship between SES and HCA with half of them finding worse HCA in deprived people and the remaining half finding greater HCA in deprived people. This may have been due to the variability in SES measures which could have influenced the relationship with outcomes in different ways and could have varying effects depending on population characteristics such as age. For SES and QoL, most studies provided evidence for the relationship between lower SES and poorer QoL but some did not. These inconsistencies could be due to different measures used in the various studies. For example, the definition and instruments used to assess HCA and QoL varied significantly. Stronger conclusions cannot be drawn due to the relatively small number of studies, their focus and quality. Higher-quality studies that focus specifically on the relationship between SES and HCA and QoL in COPD are required to better understand the impact of socio-economic status on HRQOL and healthcare access in patients with COPD. The need for consistent conceptualisation and use of SES, HCA and QoL measures as well as their appropriateness according to specific patient characteristics such as age is highlighted.

4.2 Introduction

The relationship between socio-economic deprivation and prevalence and mortality of COPD has been established in the literature (Prescott and Vestbo, 1999; Yohannes et al., 2001; Shohaimi et al., 2004). Higher risk of COPD has been associated with more deprived background, social class, occupation, area deprivation, relative poverty, education and income, social isolation and limited social support, sedentary lifestyle and loneliness (Prescott and Vestbo, 1999; Yohannes et al., 2001; Shohaimi et al., 2004). Socio-economic status in terms of education, income and occupation may not always directly affect the risk of developing COPD but can do so indirectly, for example, through housing, lifestyle or nutrition. Smoking is implicated in the occurrence of COPD (Doll et al., 1994; Peto et al., 1996) and so are airborne pollutant and biomass fuels (Rees & Calverley, 2002). Poorer quality of life in COPD has also been associated with lower socio-economic status such as lower educational level and occupational class (Miravitlles et al., 2011). COPD generates considerable health care costs especially through accident and emergency department visits, exacerbations, hospital admissions and re-admissions, prescriptions for bronchodilators and palliative care provision (Ashutosh, Haldipur, & Boucher, 1997; Sullivan et al., 2000; Osman et al., 1997). A detailed discussion between SES and COPD prevalence and mortality and implicated factors was presented in Chapter Two.

a. Health inequalities and HCA

The association between socio-economic factors and access to health care has been supported extensively in different health conditions. Lower SES was related to a variety of poorer HCA outcomes such as delayed and lower quality of care provision and limited availability of public health resources, lack of health insurance and impaired access to emergency care (Mutchler & Burr, 1991; Evans et al. 2011; Wagner et al., 2011). However, evidence for the opposite, i.e. lower SES associated with greater HCA such as consulting a GP and receiving prescriptions for medication was also reported (van der Meer et al., 1996; Bongers et al., 1997). Both these studies were conducted in the Netherlands, however, where socio-economic difference in health care services utilization are less pronounced compared to most other countries (Wagstaff & Van

Doorslaer, 1992). A detailed discussion of the relationship between socio-economic status and HCA was provided in Chapter Two.

With regard to COPD, the nature of the relationship between SES and HCA is not clear. The evidence provided in the literature has been inconsistent with some studies reporting that higher deprivation was associated with greater HCA such as access to GPs and hospital services while others reporting the opposite i.e. that higher SES was associated with greater HCA such as specialist referrals (van Heyden et al., 2003; van Doorslaer et al., 2006; Sutton et al., 2002; Masseria & Giannoni, 2010; Finkelstein, 2001; Dunlop et al., 2000; Hurley & Grignon, 2006).

b. Health inequalities and QoL

Health inequalities and SES have also been linked to quality of life. Quality of life is significantly impaired in patients with COPD in comparison to healthy populations and is poorer with increasing level of disease severity (Ketelaars et al., 1996; Okubadejo et al., 1996; Ferrer et al., 1997). QoL is also an important factor for prognosis (Balcells et al., 2010). For example, impaired quality of life in COPD patients has been linked to higher risk of hospital admission, mortality and morbidity (Osman et al., 1997; Domingo-Salvany et al., 2002; Sullivan et al., 2000). The search for the sources of influence on quality of life in COPD has inevitably led back to socio-economic factors, amongst other things, such as biological vulnerability and cultural variables.

Despite evidence for the association between QoL and SES the exact pathways through which this influence is exerted still remains elusive. A variety of mechanisms have been proposed such as health care access and biological vulnerability (Chandra et al., 2009; Dransfield et al., 2006). Other explanations suggested include decreased levels of mobility preventing patients from full-time employment and thus inability to finance diagnosis and treatment or insurance premiums which are considerably higher in COPD (Sullivan et al., 2000). This does depend on variation in the access and utilisation of the health care systems between countries. Saadat et al. (2007) emphasized that SES was a significant factor of impaired QoL in COPD patients and noted that this effect was more apparent in COPD as compared to other conditions (Prescott & Vestbo, 1999). The authors reported a socio-economic gradient in QoL in COPD based on the results from their study in which they matched three groups of patients of low-medium and high income levels and compared their QoL and physical

function. However, despite the effect of SES on QoL, Saadat et al. (2007) stressed the fact that participants were matched on confounding variables such as SES, co-morbidities and type of insurance i.e. health care access and their results were not likely to have been biased.

Lower SES has been related to poorer QoL. One of the ways low SES may exert its effect is through more severe disease possibly due to increased tobacco or biomass fuel consumption which have been linked to higher deprivation. QoL and lung function test measure different aspects of disease severity and have been used in COPD (Ferrer et al., 1999). However, no significant association was found between FEV_1 and QoL in COPD (Wijnhoven et al., 2001) suggesting that they measured different aspects of disease. Previous research reported that low SES conferred greater risk of mobility decline as compared to people with higher SES, higher likelihood of more severe chronic disease and more severe co-morbidities (Koster, et al., 2004). When these relationships were examined in relation to severity of disease, findings suggested that disease severity and comorbidity explained a very small proportion of the variance regarding socioeconomic differentials in mobility decline. This was true across all disease groups and all three socioeconomic status markers included in the study (i.e. income, education, occupation). However, in their review Hegewald & Crapo (2007) reported that lower SES was associated with poorer lung function in respiratory diseases which was attributed to smoking but also additional risk factors. As a result, the role of severity of COPD in relation to SES and QoL remains unclear.

c. The aim of this systematic review

COPD prevalence, mortality and morbidity are associated with higher deprivation. The aim of the systematic literature review was to explore whether socio-economic deprivation added to this burden through barriers to both health care access and quality of life. Existing literature on the relationship between socio-economic status and healthcare access and quality of life in patients with COPD was identified, synthesized and evaluated. The role of disease severity was also taken into consideration and examined due to inconsistent evidence as to its effect on QoL and possibly health care access. Severity of COPD could have acted as a significant confounder in the relationships observed between SES and health care access and quality of life. If poorer HCA and QoL were influenced by higher disease severity in addition to SES, it

could be assumed that patients who had more severe disease also had poorer health care access due to mobility problems, for example. Alternatively, patients could have greater health care access because of more severe COPD. This is why the role of disease severity was examined. The same could apply to quality of life. In order to examine the role disease severity and its role in the relationship between SES and health care access and quality of life, studies were divided into two categories: (a) studies that had adjusted for disease severity and (b) studies that had not adjusted for disease severity and findings were compared.

4.3 Methods

a. Introduction

This is a systematic review of observational studies of the relationship between SES and HCA and SES and QoL in COPD. In this review, evidence of the role of SES on health care access and quality of life in patients with COPD was sought. The following sections include definitions of the subject of the review, an outline of the quality criteria for the inclusion of the studies that were set and analysis of the outcomes examined including consideration of a meta-analysis if data justified one.

b. Search terms and search strategy

This is the first systematic review on SES and HCA and SES and QoL in COPD. Therefore, a search was conducted from 1947 to December 2011 of the following electronic databases: Medline, IBSS, PsychInfo, Embase, Web of Science, Ingenta Connect and CINAHL. The search strategy included various combinations of keywords “socio-economic status”, “COPD”, “health care access”, and “quality of life” including their MESH and MESH exploded terms. Detailed search terms are presented in Supplementary Table 4.1 (Appendix A1). Reference lists and citation indexing were performed in order to capture any further relevant articles. This review was conducted following the MOOSE protocol for reporting systematic reviews of observational studies (Stroup et al., 2000).

c. Selection of studies

Observational studies were selected that reported associations between socio-economic status (SES) and (a) healthcare access (HCA) and (b) quality of life (QoL) in patients with COPD and included the definitions outlined below.

d. COPD

Studies in which COPD was defined by spirometry based on criteria in the GOLD guidelines (2011) were included in the review. Additional studies that did not include spirometry were reviewed to ascertain that patients who had inadequate care were not excluded. Spirometry is the only accepted method of diagnosing and managing COPD by measuring the degree of airflow obstruction in an objective and standardised way (Barnes & Fromer, 2011; Qaseem, Humphrey, Chou, Snow, & Shekelle, 2011).

e. Socio-economic Status (SES)

Socioeconomic status (SES) was examined in terms of level of education, income and occupational class (CSDH, Measurement and Evidence Knowledge Network, 2007). These three characteristics assess different aspects of SES and would ideally be combined when trying to measure SES (Mackenbach, et al., 1999). Because this is not always feasible in studies and due to the multidimensional nature of SES which poses difficulties in its definition and measurement, composite scores such as the Index of Multiple Deprivation (IMD) scores were also included in the definition (IMD, 2010). The IMD (2010) score is an instrument used for assessment of multiple deprivation consisting of seven domains (i.e. income deprivation; employment deprivation; health deprivation and disability; education, skills and training deprivation; barriers to housing and services; living environment deprivation; and crime). The overall IMD score indicates the level of deprivation of a certain area on the basis of the aggregate scores drawn from the above dimensions.

f. Health Care Access (HCA)

Healthcare access was defined as the availability of health care services and their utilisation by people to preserve or improve their health (Gulliford, et al., 2001). For the purposes of this review, health care access included services relevant for patients with COPD, such as attendance, treatment and referral for smoking cessation and pulmonary rehabilitation and specialist assessment and treatment as well as medication uptake. Health care access did not include exacerbations of COPD or visits to the Emergency Department because they were considered to be an outcome of worse health care access and not an indicator of it. However, quality of treatment provided during exacerbations and ED visits were included as health care access measures.

g. Quality of Life (QoL)

Quality of life was defined as physical, functional, social and emotional well-being, measured with standardised and validated instruments such as the SF-36 Health Survey (Stewart, Hays, & Ware, 1988), the St. George's Respiratory Questionnaire (SGRQ) (Jones, 1991), or the Chronic Respiratory questionnaire (CRQ) (Guyatt, Townsend, Keller, Singer, & Nogradi, 1989).

h. Inclusion criteria

Relevant papers were screened for titles, duplicates were removed and abstracts were reviewed. Full texts of the abstracts that fulfilled initial screening conditions were retrieved and inclusion criteria were applied.

The criteria applied for inclusion of relevant articles were: (1) participants with spirometry-confirmed diagnosis of COPD; (2) aged 18 years or over; (3) quantitative research studies; (3) articles published in the English language; (5) report of statistical results of associations between SES and (a) healthcare access or (b) quality of life. If studies clearly met the inclusion criteria or could not be excluded based solely on the title and abstract, full text articles were obtained. The literature searches, initial title and abstract screening were conducted by the primary author (SG). Two colleagues (HB

and HT) repeated the screening process and any disagreements that arose were settled by consensus. Full texts were examined by the primary author (SG) and the supervisor (PW). Consensus was reached, where there was disagreement, on the final articles to be included in the review by discussion.

Data were extracted from 72 full-text articles using the aforementioned criteria. Data extracted included the following: measurement tools used; follow-up; definition of SES; relationship between SES & health care access examined; relationship between SES & QoL examined; statistical tests used for analyses; conclusions.

i. Quality Assessment

A 12-item scoring scale (see Appendix A2, Table 4.2) was developed to assess study quality. This scale was adapted from the one employed by Keating et al. (2011) who developed theirs based on findings from previous literature published identifying important qualitative and quantitative research aspects (Downs & Black, 1998; Eakin & Mykhalovskiy, 2003; Kitto, Chesters, & Grbich, 2008). The items on which quality of studies were evaluated included were: the quality of study design and procedure; quality of reporting methods and results; external validity; bias in measurement and use of validated instruments, definition of outcome and confounding variables. The range of the quality scores was 0 to 12. Studies that accumulated a score of ≥7 points – which had to include points for provision of clear definitions of SES, QoL and HCA as well as statistical analyses results for the association between SES and HCA and SES and QoL – were judged as being of high quality and were included in the review.

j. Assessment of disease severity as a confounder

As part of the systematic review, a second assessment of the literature was conducted in order to eliminate disease severity as a possible confounder in the relationships between SES and HCA and QoL. This was done to ensure that better or lower HCA and QoL was not an effect of severity of COPD. For example, it could be assumed that more severely affected patients had greater access to health care services due to their condition. Similarly, it could be speculated that more severe disease was associated with poorer QoL. Therefore, in the second part of the current review, only articles that

had adjusted for disease severity in their analyses were examined. With the elimination of a possible confounder in the statistical analyses, the independent effect of SES on HCA and QoL could be investigated more reliably and comparisons between the two groups could be made.

k. Analysis

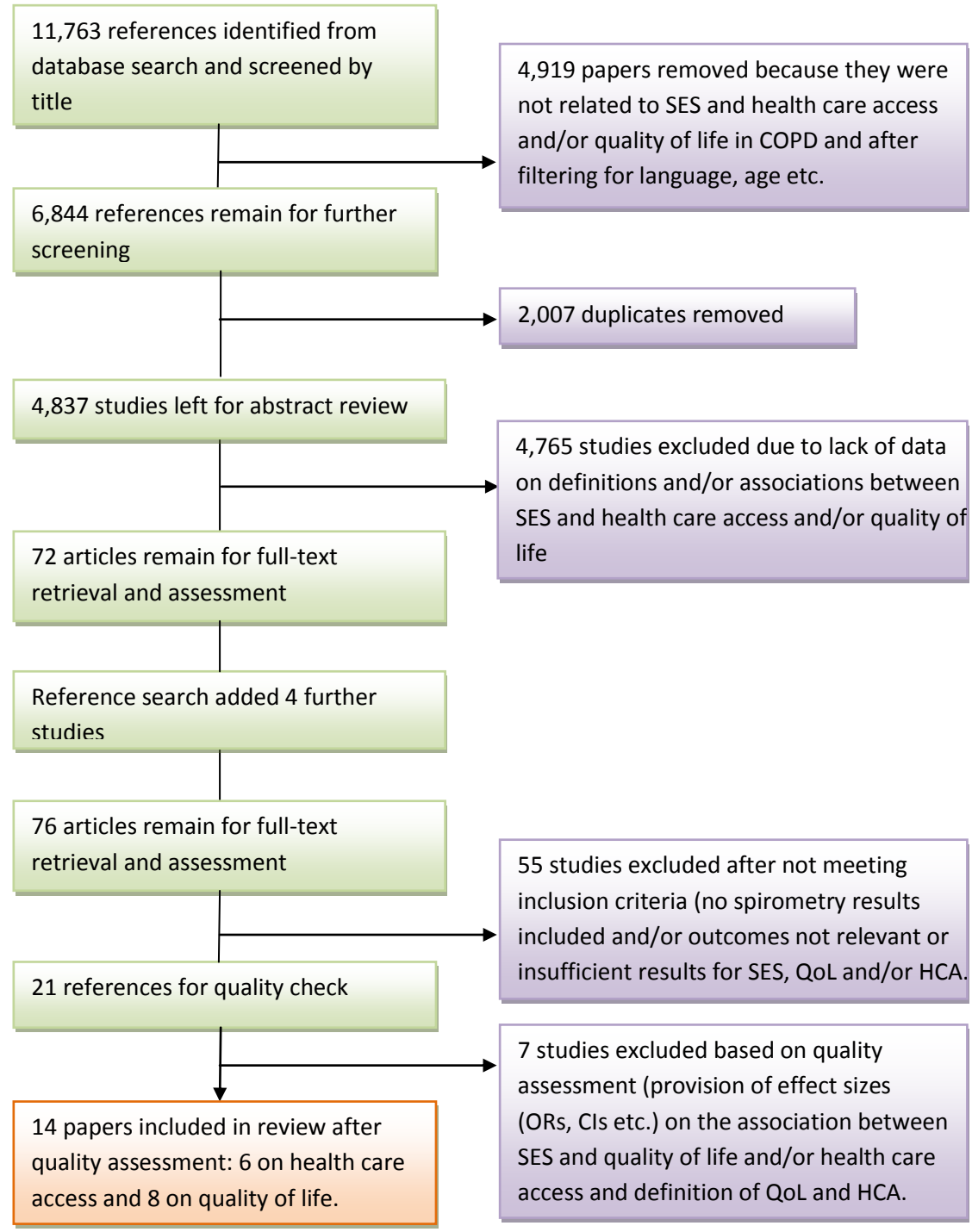
To combine the results of the data gathered in the review and identify patterns across studies, a meta-analysis was considered. There was significant variability in various domains of the studies for both HCA and QoL outcomes. The definitions used for SES, HCA and QoL differed considerably. Heterogeneity in participant population characteristics such as inclusion of various conditions (CHF, cancer and COPD, healthy population which included patients with COPD) and targeted patients diagnosed with COPD. Differences in statistical methods of analyses employed by the studies further complicated conclusions (e.g. ORs, CI, regression, mediation analyses).

Therefore, owing to the small number of studies identified and lack of homogeneity in the definitions, outcome measures and statistical methods used, it was decided not to conduct a meta-analysis but provide a narrative explanation and evaluation of the studies.

4.4 Results

The electronic search identified a total of 11,763 publications of which 14 articles were included in the first part of the review after application of the eligibility criteria and quality assessment procedures. Process details are presented in Figure 4.1.

Figure 4.1 Summary of the research process



The review examined studies reporting associations between SES and HCA and SES and QoL in COPD. Findings will therefore be reported in separate sections for each of these two outcomes.

a. SES and Health Care Access

Among 76 studies which were assessed in full, six studies examining the relationship between SES and HCA were of adequate quality and were included in the review. Of those, three studies which examined the relationship between SES and HCA found that lower SES populations had better access to health care services (Goldstein, et al., 2005; Simoni, et al., 2008; VanderSchaaf, Olson, Billups, Hartsfield, & Rice, 2010) while the remaining 3 provided evidence for higher SES associated with greater health care access (Chandra, Tsai, & Camargo, 2009; Enright, Kronmal, Higgins, Schenker, & Haponik, 1994; Prescott, Lange, & Vestbo, 2008). Study and participant characteristics are presented in Tables 4.1, 4.3, 4.5 and 4.6. Details of quality assessment scores for all 14 studies (both for HCA and QoL) are provided in Supplementary Table 4.3 (Appendix A3).

Evidence for the associations between SES and HCA was provided by the following studies. Enright et al. (1994) found lower income to be a predictor of undiagnosed airways obstruction. Higher educational attainment was associated with greater likelihood of having received a diagnosis of chronic bronchitis compared to lower education [high school education (OR=1.4, [95%CI]=1.1-1.8; p=0.008) and college education (OR=1.5, [95%CI]=(1.1-1.9); p=0.003)]. Prescott et al. (2009) reported that lower SES in terms of education and income level was related to greater risk of hospital admission especially in females [medium SES (RR= 0.74, [95% CI]=(0.55-1.02) and high SES (RR=0.27, [95% CI]=(0.10-0.73) versus low SES]). Chandra et al.'s (2009) findings indicated that lower SES was associated with poorer access to health care as measured through hospitalisation rates (medium and low SES as compared to high SES: OR=0.7, [95%]= (0.3, 0.7) and OR=2.7, [95%CI]= (0.6, 12.3); chest radiography administered (medium and low SES as compared to high SES: OR= 1.0, [95% CI]= (0.4, 2.5) and OR=2.2, [95% CI]= (0.4, 11.1)); arterial blood gas administered: (medium and low SES as compared to high SES: OR=0.7, [95%]= (0.1, 4.3) and OR=0.2, [95% CI]= (0.1, 0.9)); corticosteroids received in ED: (medium and low SES as compared to high SES: OR=1.0, [95% CI]= (0.8, 3.4) and OR=1.4, [95% CI]= (0.2, 8.7)).

The remaining three studies on HCA provided evidence for an inverse association between lower SES and greater HCA. Goldstein et al. (2005) observed greater likelihood of discussion regarding prognosis between physicians and patients with lower financial status (OR=2.26, [95%CI]=(1.03–4.96); p=0.001) compared to higher

financial status. VanderSchaaf et al. (2010) found that patients with higher educational attainment, defined as education beyond high school with or without an advanced degree, were more likely to report more variance in the use of inhalers than patients with a high school diploma or less education (OR 2.1; [95%CI]=(1.1-3.6). Simoni et al. (2008) provided evidence for less frequent use of any respiratory-related medication by less educated patients. High education was the reference value and intermediate or low had odds ratios compared to it [intermediate education OR=0.97, [95%CI]=(0.76–1.24); low education OR=0.90, [95%CI]=(0.71–1.15)]. For the use of respiratory-specific medication, such as antiallergic or broncho-pulmonary medicines, lower education was associated with more frequent medication use [ref high education: intermediate OR=0.84, [95%CI]=(0.55–1.27); low education OR=1.11, [95%CI]=(0.77–1.61)].

b. SES and Quality of Life

Among 76 studies which were reviewed in full, eight studies examining the relationship between SES and QoL were of adequate quality and were included in the review. Study and participant characteristics are presented in Tables 4.2, 4.4, 4.5, 4.6. Details of quality assessment scores for all fourteen studies are presented in Supplementary Table 4.2 (Appendix A2).

Five studies reported that lower SES was associated with poorer QoL (Hesselink, et al., 2006; Hill, 2005; Saadat, 2007). Hesselink et al. (2006) found an association between higher education and an increase in QoL at 2-year follow-up in patients with COPD but this was not statistically significant [educational level: medium vs low (β=1.36, [95% CI]=(−0.22, 2.93); and high vs low (β=2.09, [95% CI]=(−0.08, 4.26); p<0.10). Saadat et al. (2007) showed that lower SES was associated with poorer QoL and physical function (difference between Group I (31.2 ±11.8), Group II (36.1±11.6); Group III (36.8 ±14.4) p< 0.05). Hill's (2005) findings indicated that higher SES in terms of education was directly related to better QoL (β=0.22, R=0.49, R2=0.201, p<0.001). (Moy, et al., 2009) found that higher education (post secondary) compared to lower education (pre-secondary) was associated with better QoL in terms of mental health [(OR=4.6 [95%CI]=(3.3 to 5.8); p<0.001] and better QoL in terms of physical symptoms, disease activity, and effects on daily life [(OR=-4.7, [95%CI]=(−6.3 to −3.2); p<0.001]. Eisner et al. (2011) reported that lower educational attainment and lower

income level were both associated with poorer lung function and greater physical limitations. The lowest income category compared to the highest income category was associated with a lower distance walked, (-303 feet; 95% CI -380 to -227 feet), as well as higher risk of COPD exacerbations [(HR=1.5; [95%CI]=(1.01 to 2.1) and HR=2.1; [95%CI]=(1.4 to 3.4)]. Lower SES in terms of education and income level was also associated with poorer BODE scores (measure of disease severity status) [ref. college degree level education: some college [(OR=0.6, [95%CI]=(0.3-1.0)], less than high school [(OR=1.0, [95%CI]=(0.6-1.3) and [ref income level high: medium [(OR=0.7, [95%CI]=(0.4-1.0), low [(OR=1.7, [95%CI]=(1.2-2.2)].

The three remaining papers that examined the relationship between SES and QoL did not find any support for such an association or found inconsistent evidence (Kanervisto, et al., 2010; Van Manen, et al., 2002; Wijnhoven, et al., 2001). Wijnhoven et al. (2001) did not find a statistically significant association between educational level and QoL (β= 0.09, p≤0.10). Van Manen et al. (2002) found that educational attainment was not related to depression (OR=0.8, [95% CI]=(0.2-3.0)). While depression is not a usual element of QoL, it was considered a form of emotional well-being for the purposes of this review and was included in the analysis. Kanervisto et al. (2006) did not find evidence to support an association between lower SES in terms of income and educational level and poorer QoL. When compared to high income level QoL in terms of activities of daily living (ADL) was better for middle and low income levels [(middle OR=0.47, [95%CI]=(0.05–4.07) and low (OR=1.76, [95%CI]=(0.21–14.57)]. QoL in terms of instrumental activities in daily living (IADL) was poorer for middle and low income levels compared to high income level [(middle OR=1.18, [95%CI]=(0.04–0.86) and low OR=0.47, [95%CI]=(0.10–2.17). QoL in terms of social functioning (pastime and hobbies) was better for lower compared to higher income levels: middle OR=1.75, [95CI]=(0.32–9.44) and low OR=1.88, [95%CI]=(0.34–10.54). When compared to high income level QoL in terms of psychological functioning was better for lower income levels [middle OR=0.69, [95%CI]=(0.19–2.43) and low OR=1.42, [95%CI]=(0.39–5.15). For education, compared to high educational attainment, lower educational levels reported were associated with poorer QoL in terms of ADL [ref high educational level: ADL: secondary OR=0.96, [95%CI]=(0.19–4.75) and basic OR=0.72, [95%CI]=(0.15–3.33)] and IADL [secondary OR=0.86, [95%CI]=(0.23–3.24) and basic OR=0.52, [95%CI]=(0.14–1.93)]. QoL in terms of social functioning was better in lower educational levels compared to higher education [secondary OR=2.26, [95CI]=(0.52–9.83) and basic OR=2.60, [95%CI]=(0.63–10.75)] as was QoL in terms of psychological

functioning [secondary OR=0.98, [95%CI]=(0.29–3.26) and basic OR=1.93, [95%CI]=(0.63–5.91)].

c. SES and HCA and QoL adjusting for disease severity

The aforementioned findings could be a result of varying severity of COPD among people with different SES. Patients with more severe COPD could have had better access to health care services because they were experiencing poorer QoL. In order to examine whether disease severity might have confounded these relationships a second analysis was performed. Studies that had not adjusted their analyses for disease severity were excluded. Findings did not differ significantly compared to the ones described above. Three studies examining the relationship between SES and HCA (Goldstein et al., 2005; VanderSchaaf et al., 2010; Enright et al., 1994) and two studies examining the relationship between SES and QoL (Hill, 2005; Eisner et al., 2011) were included in the analysis (see Tables 4.5 and 4.6).

For HCA, one study found lower SES to be associated with greater health care access and two found support for the opposite. The first was Goldstein et al. (2005) who reported that lower financial status was associated with higher likelihood of a discussion regarding prognosis occurring between physicians and patients (OR=2.26, [95%CI]=(1.03–4.96); p=0.001) compared to higher financial status.

VanderSchaaf et al. (2010) found that more educated patients (beyond high school with or without an advanced degree), were more likely to report variability in the frequency of use of inhaled medication than patients with a high school diploma or less education (OR 2.1; [95%CI]=(1.1-3.6). Enright et al. (1994) found that diagnosed airways obstruction was twice as likely in patients with higher education compared to patients with lower education [high school education (OR=1.4, [95%CI]=1.1-1.8; p=0.008) and college education (OR=1.5, [95%CI]=(1.1-1.9); p=0.003)].

Hill's (2005) findings suggested that higher SES in terms of education was directly related to better QoL (β=0.22, R=0.49, R2=0.201, p<0.001). Eisner et al. (2011) found associations between lower educational attainment and lower income level and poorer lung function as well as greater physical limitations. The lowest income category was associated with a shorter walked distance (-303 feet; 95% CI -380 to -227 feet) when controlling for disease severity and higher risk of COPD exacerbations [(HR=1.5;

[95%CI]=(1.01 to 2.1) and HR=2.1; [95%CI]=(1.4 to 3.4)] compared to the highest income category. Lower SES in terms of education and income level was also associated with poorer disease severity status [ref college degree level education: some college [(OR=0.6, [95%CI]=(0.3-1.0)], less than high school [(OR=1.0, [95%CI]=(0.6-1.3) and [ref income level high: medium [(OR=0.7, [95%CI]=(0.4-1.0), low [(OR=1.7, [95%CI]=(1.2-2.2)].

Table 4.1 Study Characteristics – Health Care Access (HCA)

Authors	Aim	Study Design	Country	Spiro-Metry	Severity Adjusted	Sample	Definition SES	Definition QoL	Definition HCA	Findings re SES & HCA/QoL
Enright et al. (1994)	To provide prevalence rates for major respiratory symptoms and lung diseases from this cohort by smoking status and identifying correlates of respiratory conditions	Cohort-prospective	USA	Yes	Yes	5,201	Education completed, annual income	Baseline examination and a subset of ATS/DLD-78 respiratory questionnaire.	Diagnosis of airways obstruction	Undiagnosed airways obstruction was twice as likely in people of lower income.
Goldstein (2005)	To examine the association of patient ethnicity and financial status with patient and clinician reports of discussions about prognosis.	Cross-sectional survey	USA	No	Yes	226	Financial status was categorised as "money left over";"just enough to make ends meet"; and "not enough money"	Not measured	Defined discussions of prognosis as communi-cation about whether the patient could die as a result of her/his illness	Patients and clinicians were more likely to agree that discussions about prognosis had taken place when patients had a lower financial status
Simoni et al. (2008)	To assess the habitual uptake of medicines in subjects with respiratory symptoms/diseases or impaired lung function in general population samples	Cross-sectional survey	Italy	Yes	No	4,010	Educational attainment (low-intermediate-high)	Not measured	Habitual uptake of medications	Use of medicines was positively and significantly associated with education. Medicines consumed more frequently by less than more educated participants
Prescott et al. (2009)	To analyse the effect of educa-tion on development of COPD assessing lung function and hospital admission	Cross-sectional study	Denmark	Yes	No	14,223	Educational attainment & income (low-med-high) Socio-economic index (combination category of education and income)	Not measured	Hospital admission	Education, household income and socio-economic index were all predictors of hospital admission
Chandra et al. (2009)	To investigate quality of emergency care for patients with AECOPD	Prospective multicenter cohort study	USA & Canada	Yes	No	330	Median family income (low-medium-high) and insurance status (commercial/private/none)	Not measured	Provision of emergency care	African-American & Hispanic patients with COPD had lower SES and poorer access to primary care compared with white patients
Vander-Schaaf et al. (2010)	To determine the extent of and reported reasons for patient-reported variance in the use of inhalers prescribed for COPD	Cross-sectional survey	USA	Yes	Yes	265	Education level	Not measured	Patient-reported inhaler variance	Higher education level, home oxygen use & prescriptions for ipratropium were predictors for inhaler variance

Table 4.2 Study Characteristics – Quality of Life (QoL)

Authors	Aim	Study Design	Country	Spirometry	Severity	Sample	Definition SES	Definition QoL	Main Findings re SES & HCA/QoL
Wijnhoven et al. (2001)	To identify determinants of pulmonary function and health-related quality of life (HRQoL)	Cross-sectional community study	Netherlands	Yes	No	1135 (asthma 837 COPD 231)	Educational attainment (low-medium-high)	Breathing problems; physical problems; emotions; general activities; daily/domestic/social relationships	Education was not associated associated with HRQOL
Van Manen et al. (2002)	To investigate the incidence of depression in COPD & to determine the demographic & clinical variables associated with it	Case-control study	Netherlands	Yes	No	162 COPD (359 controls)	Educational attainment (low-high); insurance (NHS/private); living conditions /alone/with others	Frequency and severity of respiratory symptoms and activities limited by breathlessness; symptoms and physical functioning	Education was not related to depression
Hill (2005)	To determine the extent to which manifest symptom distress, physical function alterations, self-esteem, social functioning alterations and spiritual well being explain QoL in COPD patients	Cohort-Prospective	USA	Yes	Yes	148	Educational level and income (l-m-h)	QoL defined at the extent to which a person's assessed level of satisfaction with life and overall sense of well-being	Disease severity stage, comorbid conditions,educational level, manifest symptom distress & spiritual well-being were found to be directly related to QoL in COPD patients
Hesselink et al. (2006)	To examine predictors of decline in pulmonary function (FEV1) or HRQoL in patients with asthma or COPD	Cohort prospective	Netherlands	Yes	No	500 120 (COPD) 380 (Asthma)	Educational attainment (low-medium-high)	Breathing problems, physical problems, emotions, general activity, daily domestic/social activities	A decline in HRQoL was associated with lower education, lower body weight, more dyspnoea, & more respiratory symptoms in COPD
Kanervisto et al. (2006)	To investigate the negative impact of illness on HRQoL in people with COPD	Health Examination Survey	Finland	Yes	No	6,354	Educational attainment (basic-secondary-higher) Income (low-middle-high)	Spirometry, ADL, IADL, exercise, hobbies, pastime and experiences	No significant association between SES and QoL
Saadat et al. (2007)	To investigate the association between income and QoL in COPD patients	Case-control study	Iran	Yes	No	131	Educational attainment Monthly income (low-med-hi)	Overall QoL	QoL and physical function were significantly correlated to SES in COPD patients
Moy et al. (2009)	To identify the independent determinants of HRQL in COPD	Multicentre RCT	USA	Yes	No	1,621	Educational attainment (low/ medium to high)	Overall QoL	Education was one of the determinants of MCS score
Eisner et al. (2011)	To determine the independent impact of SES and ethnicity/ethnicity on COPD severity status, functional limitations and acute exacerbations of COPD among patients with HCA	Cohort-Prospective	USA	Yes	Yes	1,202	Educational attainment and household income (low-medium-high)	Severity status, functional limitations	Lower educational attainment & income were related to greater disease severity, poorer lung function and greater physical functional limitations

Table 4.3 Patient Characteristics – Health Care Access (HCA)

Authors	Age (Mean)	Sex	Ethnicity	Groups	Co-morbidities	Smoking	Mean FEV1	Measurement Tool	SES 1 (Income)	SES 2 (Education)	SES 3 (Occupation)	Effect Size/OR
Enright et al. (1994)	65+ (men M=73.3;women M=72.2)	45% M	4% non-white	1	Not mentioned	Yes	Yes	ATS DLD-78 Respiratory Questionnaire Baseline examination	High – Low (annual)	37% Low/med. (high school) - 34% High (Practitioners)	Not measured	Higher education predicted greater likelihood of airway obstruction diagnosis OR 0.32,95%CI,0.16-0.66,*p*=.001
Goldstein et al. (2005)	72.8 (SD=7.3) >80yrs=19.6% (60-93)	42.1% F 57.9% M	White/ Non-white	3 (cancer/ (CHF/COPD)	No	No	No	Questionnaire on discussion about prognosis (HCA)	7.9% (low) 45.3% (med) 43.9% (high)	68.7% (<HS) 31.3% (>HS)	Not measured	Lower financial status predicted discussion about prognosis (OR=2.26, [95%CI]=(1.03–4.96); *p*=0.001)
Simoni et al. (2008)	N. Italy (M=39.5; SD=16.2) Centr/N. Italy (M=45; SD=17.4)	48.3% M 52.8% F	Not mentioned	2 (N. Italy vs urban Central/N. Italy)	Yes	Yes	Yes	Questionnaire for data on habitual or occasional use of medicines. Positive response to "Are you habitually taking medicines?"	Not mentioned	42.9% (low) 29.5% (med) 27.5% (high)		Habitual use of medications: Education Intermediate: OR 0.84,95% CI, 0.55-1.27 Education Low: OR 1.11,95% CI, 0.77-161
Prescott et al. (2009)	M=50.4 yrs (F) M=52.7 yrs (M)	54.2% F 45.8% M	Not mentioned	9 (3 groups each category: education ,household income, socio-economic index	No	Yes	Yes	National Hospital Discharge Register to monitor patients' hospital admissions	16.7% (low) 25.1% (med) 9.1% (high)	24.5% (low) 21.3% (med) 5.1% (high)		Relative Risk (RR) for admission to hospital for COPD by medium/high vs. low socio-economic index: in females: RR: -0.74,95% CI, 0.55-1.02), and RR: 0.27, 95% CI, 0.10-0.73) respectively. For males: RR: 0.47, 95% CI, 0.36-0.63) and RR: 0.35 (0.17-0.70) respect.
Chandra et al. (2009)	M=68 yrs	53% F 47% M	66% white 25% Afr.-Amer.	3 (white/ (African-American/ Hispanic)	No	Yes	No	SF-CRQ; Health Care Effectiveness Data and Information Sets (HEDIS) composite guideline concordance score	Insurance Status (Private: White 37%; African-American 12%; Hispanic 11%/Medicaid: 10% - 30% - 37%/Medicare or None: 53% - 58% - 52%) Minority Proportion (W: M=14; AA: M=73; H: M=88) High Minority Proportion (W: M=10; AA: M=50; H: 16)			Quality of Care: Hospital admission African-American (OR 0.7, 95%, 0.3, 1.7); Hispanic (OR 2.7, 95%CI, 0.6, 12.3). Received chest radiography: Afr-Amer (OR 1.0, 95% CI, .4, 2.5); Hispanic (OR 2.2, 95% CI, 0.4, 11.1). Received arterial blood gas: Afr.-Amer. (OR 0.7, 95%, 0.1, 4.3) Hispanic (OR 0.2, 95% CI, 0.1, 0.9). Received corticosteroids in ED: Afr.Americ.(OR 1.0, 95% CI, 0.8, 3.4); Hispanic (OR 1.4, 95% CI, 0.2, 8.7)
Vander-Schaaf et al. (2010)	73 (SD=8)	48.7% M	White/Cauc. Black/Afr. Amer. Asian/Pacif Isl Americ. Ind./Alask.Nat. Hspnc/Latino/Other	1	No	Yes	8.7% (mild) 47.2% (moder) 35.1% (severe) 9.1% (very sev.) (based on GOLD criteria)	17-item survey (HCA)	Not measured	11% not finish HS 34.3% HS graduate 31% Diploma 21.5% College Grad	Not measured	Higher educational level predicted greater inhaler variance OR=2.1, [95% CI]=(1.1-3.6)

Table 4.4 Patient Characteristics – Quality of Life (QoL)

Authors	Age (Mean)	Sex	Ethnicity	Groups	Co-morbidities	Smoking	Mean FEV1	Measurement Tool	SES 1 (Income)	SES 2 (Education)	SES 3 (Occupation)	Effect Size/OR
Wijnhoven et al. (2001)	M=58 (SD=14)	54% M 46% F	Not mentioned	2 (asthma and COPD)	Yes	Yes	Yes	Quality of Life in Respiratory Illness Questionnaire (Maille et al., 1997)	Not mentioned	53% (low 29% (med) 17% (high)	Not mentioned	Higher educational level was not associated with QoL (β= 0.09, $p \leq 0.10$) in COPD
Van Manen et al. (2002)	FEV1<50%: M=67.8(SD=8.7) FEV1=50%-80%: M=66.2(SD=10.3) Contr: M=65.6;SD=12.8)	M: FEV1<50% =73.3%, FEV1=50% -80%=70.6%) Contr.:40.4%	Not mentioned	2 (COPD and (controls)	Yes	Yes	Yes	St George's Respiratory Questionnaire (SGRQ) and CES-D	NHS Insurance FEV1<50%: 75% FEV1 50-80%: 76.2% Controls: 68.5%	Low Education FEV1<50%: 88.1% FEV1 50-80%: 85% Controls: 80.1%	Educational level was not associated with depression in COPD (OR 0.8, 95% CI, 0.2-3.0). NHS Insurance was not associated with depression in COPD (OR 1.3, 95% CI, 0.4-4.4)	
Hill (2005)	67 (SD=9.4)	70% F 30% M	Not mentioned	1	Yes	No	24% (mild) 33% (moderate) 43% (severe)	SF-36 & Quality of Life Visual Analogue Scale	47% (low) 24% (medium) 29% (high)	4% (low) 58%(med) 38% (high)		$R=.49, R^2=.201, Adj.R^2=.18$, =.222 T=4.1, sign. t=.00; income corr. coeff=.331; education corr.coeff=.375
Hesselink et al. (2006)	Asthma: 45.0 (SD=14.3); COPD: 57.5;SD=13.4)	Male: Asthma: 34% COPD: 58%	Not mentioned	2 (asthma and COPD)	Yes	Yes	Yes	Quality of Life in Respiratory Illness Questionnaire (Maille et al., 1997)	Not mentioned	69% (low) 21% (med) 10% (high)		Educational level was associated with QoL medium/low (β= 1.51, 95% CI, (-0.23, 3.24); High/low: (β= 1.75, 95% CI, -0.61, 4.11)
Kanervisto et al. (2006)	30-50yrs= 11% 50-70yrs=44% 70+=45%	62% M 38% F	Not mentioned	4 (general population/chronic bronchitis/COPD whole study population)	Yes	Yes	Yes	ADL and IADL questionnaires; adaptation of Mini-Finland Health Survey	65% (low) 26% (med) 9% (high)	63% (low) 26% (med) 14% (high)		Secondary educ. for ADL(OR 0.96,95% CI, 0.19-4.75) for IADL(OR 0.86,95% CI:0.23-3.24) Basic educ. for ADL)(OR 0.7295% CI, 0.15-3.33), for IADL(OR 0.52, 95% CI,0.4-1.93),
Saadat et al. (2007)	58.3±11.0yrs (range, 45-82 years)	61% M 39% F	Not mentioned	3 (Income Group I (low) Group II (med) Group III (high)	Yes	Yes	Yes	MOS SF-36	40% (low) 47% (med) 13% (high)	36% (illiterate) 30% (element.) 14% (secondary) 17% (dipl)/ 3% (univ)		Total QoL was significantly associated with monthly income in COPD. Difference between Group I (31.2 ±11.8), Group II (36.1±11.6); Group III (36.8 ±14.4) p< 0.05
Moy et al. (2009)	M=66 ±6years	60% M 40%F	94% white	1 COPD	Yes	Yes	Yes	MOS SF-36; St. George's Respiratory Questionnaire total Score (SGRQ-TS), and Self-Administered Quality of-Well-Being Scale (QWB-SA) total score	Not mentioned	80% High School or Higher 20% Lower than High School		Education was associated with the MOS SF-36 MCS Score (R^2=0.35; OR 2.3 95% CI, 1.2-3.3, p<0.001)
Eisner et al. (2011)	57.5 (6.4) (56.1-58.6)	57.2% F 42.8%M	White/Black/ Hispanic/Asian/ Other	5 (ethnicity)	Yes	Yes	Not mentioned	BODE Index (QoL)	12.4% (low)	27.6% element. 55.8% (med) 21.2% (high) 8.8% (missing)	Not measured	Lower education and income levels predicted greater physical functioning limitations -303 feet; (95%CI)-380 to -227feet

Table 4.5 Study Characteristics - Disease Severity Adjusted Studies

Authors	Aim	Study Design	Country	Spirometry	Severity adj.	Sample	Definition SES	Definition QoL	Definition HA	Findings re SES & HCA/QoL
Health Care Access (HCA)										
Enright et al. (1994)	To provide prevalence rates for major respiratory symptoms & lung diseases from this cohort by smoking status and identifying correlates of respiratory conditions.	Cohort-prospective	USA	Yes	Yes	5,201	Education completed, annual income	Baseline examination and a subset of ATS/DLD-78 respiratory questionnaire.	Diagnosis of airways obstruction	Undiagnosed airways obstruction was twice as likely in people of lower income. Dyspnoea on exertion was positively associated with lower education.
Goldstein et al. (2005)	To examine the association of patient ethnicity and financial status with patient and clinician reports of discussions about prognosis.	Cross-sectional survey	USA	No	Yes	226	Financial status was dichotomized as "money left over";"just enough to make ends meet"; and "not enough money"	Not measured	Defined discussions of prognosis as communi-cation about whether the patient could die as a result of her/his illness	Patients and clinicians were more likely to agree that discussions about prognosis had taken place when patients had a lower financial status or were non-white
Vander-Schaaf et al. (2010)	To determine the extent of & reported reasons for patient-reported variance in the use of inhalers prescribed for COPD	Cross-sectional survey	USA	Yes	Yes	265	Educational level	Not measured	Patient-reported inhaler variance	Higher educational level, home oxygen use and prescriptions for ipratropium were predictors for inhaler variance
Quality of Life (QoL)										
Eisner et al. (2011)	To determine the independent impact of SES & ethnicity/ethnicity on COPD severity status, functional limitations and acute exacerbations of COPD among patients with HCA	Cohort-Prospective	USA	Yes	Yes	1,202	Educational attainment and household income (low-medium-high)	Severity status, functional limitations	Exacerbations (E&D visits & hospitalisations)	Lower educational attainment & income were related to greater disease severity, poorer lung function and greater physical functional limitations
Hill (2005)	To determine the extent to which manifest symptom distress, physical function alterations, self-esteem, social functioning alterations and spiritual well being explain QoL in COPD patients	Cohort-Prospective	USA	Yes	Yes	148	Educational level and income (l-m-h)	QoL defined at the extent to which a person's assessed level of satisfaction with life and overall sense of well-being	Not measured	Disease severity stage, comorbid conditions, educational level, manifest symptom distress and spiritual well-being were found to be directly related to QoL in COPD patients

Table 4.6 Patient Characteristics – Disease Severity Adjusted Studies

Authors	Age (Mean)	Sex	Ethnicity	Groups	Co-morbidities	Smoking	Mean FEV1	Measurement Tool	SES 1 (Income)	SES 2 (Education)	SES 3 (Occupation)	Effect Size/OR
Health Care Access (HCA)												
Enright et al. (1994)	65+ (men M=73.3;women M=72.2)	45% M	4% non-white	1	Not mentioned	Yes	Yes	ATS DLD-78 Respiratory Questionnaire Baseline examination	High - Low (annual)	37% Low/med. (high school) - 34% High (Practitioners)	Not measured	Higher education predicted greater likelihood of airway obstruction diagnosis OR 0.32,95%CI,0.16-0.66,*p*=.001
Goldstein et al. (2005)	72.8 (SD=7.3) >80yrs=19.6% (60-93)	42.1% F 57.9% M	White/ Non-white	3 (cancer/ CHF/COPD)	No	No	No	Questionnaire on discussion about prognosis (HCA)	7.9% (low) 45.3% (med) 43.9% (high)	68.7% (<HS) 31.3% (>HS)	Not measured	Lower financial status predicted discussion about prognosis (OR=2.26,95%CI(1.03–4.96); *p*=0.001)
Vander-Schaaf et al. (2010)	73 (SD=8)	48.7% M	White/Cauc. Black/Afr. Amer. Asian/Pacif Isl Americ. Ind./Alask.Nat. Hspanic/Latino/Other	1	No	Yes	8.7% (mild) 47.2% (moder) 35.1% (severe) 9.1% (very sev.) (based on GOLD criteria)	17-item survey (HCA)	Not measured	11% not finish HS 34.3% HS graduate 31% Diploma 21.5% College Grad	Not measured	Higher educational level predicted greater inhaler variance OR=2.1, [95% CI]=(1.1-3.6)
Quality of Life (QoL)												
Eisner et al. (2011)	57.5 (6.4) (56.1-58.6)	57.2% F 42.8%M	White/Black/ Hispanic/Asian/ Other	5 (ethnicity)	Yes	Yes	Not mentioned	BODE Index (QoL)	12.4% (low) 55.8% (med) 21.2% (high) 8.8% (missing)	27.6% element.	Not measured	Lower education and income levels predicted greater physical functioning limitations -303 feet; (95%CI)-380 to -227feet
Hill (2005)	67 (SD=9.4) (48-78)	70% F 30% M	Not mentioned	1	Yes	No	24% (mild) 33% (moderate) 43% (severe)	SF-36 & Quality of Life Visual Analogue Scale	47% (low) 24% (medium) 29% (high)	4% (low) 58%(med) 38% (high)	Not measured	Higher educational level predicted better QoL R=0.49 R^2=0.201, *p*<0.01

4.5 Discussion

The main finding of this systematic review was that low SES was not consistently associated with worse healthcare access, but low SES was consistently associated with worse QOL in COPD. Results were similar when disease severity was adjusted for in order to ascertain that disease severity was not a confounding variable in the relationship between SES and HCA and SES and QoL.

The current review identified a small number of studies that examined the relationship between SES and HCA and QoL in patients with COPD. Statistical results on their associations were included in the analyses but were not the main aim of their research. Therefore, conceptualisation and assessment of SES, HCA and QoL was not the primary concern and their measures did not reflect different aspects of these outcomes. For instance, the studies used one or two SES indicators i.e. income, education, or occupation and categorised them using different criteria into low-medium-high or low-high. Other studies defined income as the amount of money left over each month on the basis of patients' insurance status. Similarly, different outcomes and instruments were used to assess HCA (e.g. likelihood of diagnosis, discussion about prognosis, medication uptake, provision of emergency care) and QoL (e.g. SF-36, ADL, social, physical and psychological functioning, overall QoL). Study quality and significant heterogeneity in the conceptualisation and measurement of SES, HCA and QoL measures complicated comparison across studies. The need for further research for studies that focus on associations between SES and HCA and QoL in COPD is highlighted. A further point was the lack of homogeneity in the design used across studies, as well as in population characteristics such as differences in age, gender proportion, COPD severity stages and inclusion of other patient groups (e.g. CHF, cancer). This posed further difficulties in drawing clear conclusions regarding the impact of SES on HCA and QoL in COPD. The main weakness highlighted is the fact that most of the studies examined did not set out to test the hypotheses which were the subject of this review. This led to inadequacies in study design particularly with respect to adjustment for disease severity, but also with respect to the measures chosen, their limited breadth, and the rigour with which they were applied.

a. Variability in the definition and use of SES, HCA and QoL measures

Two additional sources of complication in synthesizing the data and interpreting results were lack of common understanding of what constituted HCA and lack of uniform use of SES and QoL measures. HCA commonly refers to health care services and support available to people to preserve or improve their health (Gulliford, et al., 2001). This would include services such as attendance, treatment and referral i.e. prescribed medication received, attendance at medical care (including smoking cessation and pulmonary rehabilitation) and referral for smoking cessation, pulmonary rehabilitation and specialist assessment and treatment. Reference to these HCA outcomes was made due to their importance in COPD management. The complication arises in issues such as exacerbations of COPD which would not normally be considered health care access indicators but rather an outcome of poor disease control due to uncertainty about the ability of medical care to control exacerbations. Studies employed different concepts and measures of HCA, for example medication uptake, inhaler variance, diagnosis of airway obstruction or successful communication between doctor and patient as proxies for HCA. Heterogeneity of the measures used prevented drawing conclusions. These HCA measures varied significantly and some could be considered as aspects of good clinical care. The lack of common understanding of HCA led extension of the definition and inclusion of studies with different indicators. In addition, the reason behind the variability in defining HCA could lie in the fact that most of the studies included in the review focused on exploring other relationships and included associations between demographic and socioeconomic variables and HCA as part of their research. Their aim was not to examine the effect of SES on HCA and therefore the need for more comprehensive and consistent assessment was not of primary concern to these studies.

A further issue was the lack of uniform use of QoL measures. Some studies used standardised instruments such as the SF-36, others relied on the BODE Index and other used physical functional measures. This lack of homogeneity made comparisons across study findings more complicated

Last but not least the variability in the definition and assessment of SES needs to be taken into account when interpreting and evaluating findings. Findings provided by studies examining the role of SES in relation to health inequalities are inconsistent (Shavers, 2007). The reasons suggested for this inconsistency include: (a) insufficient

precision and reliability of SES measures; (b) limitations in collecting individual SES data; (c) varying SES during life; (d) classification of SES (e.g. unemployed or retired people); (e) weak or non-existent correlation between individual SES measures and (f) lack of accuracy and reliable interpretation of results (Shavers, 2007). (Shavers, 2007) also emphasized the fact that the selection of SES measures should be based on the specific characteristics of the population investigated such age or health disparities. Further examples are educational level as well as occupational class which might not act as appropriate SES characteristics in later age as in younger adulthood (Braveman et al., 2005; Kaplan et al., 1987; Liberatos et al., 1988). SES characteristics derived earlier in life such as occupation or income may not reflect SES in late adulthood due to major life changes such as retirement. For example, social status held through one's occupational class while in active employment might not be such a strong factor after retirement (Kaplan et al., 1987). Variability in the findings suggested that different SES measures might be more appropriate for assessing specific outcomes such as HCA and/or QoL. For example, IMD might be more sensitive in relation to HCA due to its reference to area-level characteristics which would include availability and access to health care services while weekly household income level might be more appropriate in reflecting more individual-based behaviours related to health status such as diet, exercise and lifestyle.

b. Key findings for SES and HCA and QoL in COPD

With the issues highlighted above, findings examining the impact of SES on health care access followed two directions. One group of studies suggested that lower SES was related to greater HCA in terms of respiratory-specific medication consumption, inhaler variance and likelihood of discussion of prognosis between physicians and patients. The other group of studies suggested that lower SES was associated with poorer HCA in terms of receiving a diagnosis of chronic bronchitis, greater risk of hospital admission and hospitalisation during an acute exacerbation of their COPD.

In the second part of the review, where studies that had adjusted for disease severity were excluded, similar results emerged. The first group found that lower SES seemed to be related to better access to health care in terms of inhaler variance and likelihood of discussion of prognosis between physicians and patients. The second group of

studies reported that lower SES was associated with poorer HCA in terms of receiving a diagnosis.

For the relationship between SES and QoL, most studies found suggested that lower SES was related to poorer QoL. Three studies did not find any statistically significant associations between SES and QoL in COPD. Exclusion of the studies that had not adjusted for disease severity resulted in two remaining studies showing that lower SES was associated with poorer QoL. The studies that did not find significant associations between SES and QoL were cross-sectional community health surveys which could have limited conclusions to temporal associations and lack of causal relationships. In contrast, the studies that reported significant relationships between SES and QoL included cohort prospective studies, case-control studies and randomized controlled trials. Their robust design must be taken into consideration regarding the strength and authority of their findings.

c. The possible confounding role of disease severity in the relationship between SES and HCA and QoL

Disease severity was considered a possible confounder in the relationship between SES and HCA and QoL. If HCA was poorer in lower SES groups, it could have resulted in more severe COPD or vice versa. More severe COPD has been associated with lower SES due to greater exposure to biomass fuels and tobacco smoke. Therefore, it would not have been clear whether poorer QoL was due to low SES, poor HCA or more severe disease. The importance of this issue can be highlighted by making reference to two high quality studies which reported statistically significant results regarding SES and HCA and QoL, but were excluded from the review due to lack of disease severity adjustment in their analyses. Tsai et al. (2007) found that despite considerable ethnic and SES differences in stable COPD patients, quality of emergency care provision was of equal standard for all the groups during exacerbations and all presented similar outcomes in the short-term. However, the authors did not control for severity and thus it cannot be established whether this lack of difference in treatment quality is attributable to the severity of the COPD or to the patients' SES. More severely affected patients would be expected to need and receive greater medical care regardless of their SES. Hesselink et al. (2006) examined predictors of change in pulmonary function and quality of life in patients with COPD.

Their findings showed that lower educational attainment was associated with a decline in QoL. But like in Chandra et al. (2009), disease severity was not controlled for in this study. Therefore, their findings cannot support a direct effect of SES on QoL. However, results did not differ significantly with the exclusion of the "non-adjusting" studies. This could be due to the small number of studies included in the current review. Future studies need to focus on examining the impact of SES on HCA and QoL. In addition, more homogeneous definition and assessment of SES, HCA and QoL is required.

d. Limitations

There are some limitations in this systematic review which pertain mainly to the material that was available to be examined. These limitations were: (a) there was a small number of studies investigating the role of SES in HCA and QoL in COPD (b) the main aim of the studies identified was not the examination of the relationship between SES and HCA and QoL in COPD (Enright et al., 1994; Simoni et al., 2008; Chandra et al., 2009; VanderSchaaf et al., 2010; Hill, 2005; Hesselink et al., 2006; Kanervisto et al., 2006; Moy et al., 2009); (c) the populations examined in the studies varied to the extent that it was difficult to draw clear conclusions (Goldstein et al., 2005; Chandra et al., 2009; Wijnhoven et al., 2001; Van Manen et al., 2002; Hesselink et al., 2006; Kanervisto et al., 2006). For example, patients who had not only COPD but also other chronic illnesses were examined within the same studies and patients with varying severity of COPD were examined across studies; (d) there was no common understanding of the definition of health care access; (e) there was no common use of a QoL outcome measure; and (f) there was no common use of an SES measure.

The aforementioned limitations prevent strong conclusions based on the findings due to lack of homogeneity in measures and data. Studies that included patients who had received a diagnosis of COPD on the basis of their symptoms by their physician but in whom COPD was not confirmed through spirometry were not excluded from the review but examined in a separate group. The reason was to reduce bias in case of non-provision of spirometry to patients due to their more deprived background. No significant differences were found between studies that had confirmed COPD through spirometry and those who had based diagnosis solely on patient-reported symptoms or physician-diagnosed COPD.

e. Implications for future research

The need is highlighted for future studies to focus on examining the impact of SES on HCA and QoL in COPD. The use of more consistent measures of health care access and quality of life was emphasized as well as more comparable variables, outcomes, more concrete measures and definitions of SES. There is a need for the focus to shift onto the examination of SES and quality of life and health care access as the main aim of the research and an even greater need for adjustment of disease severity in statistical analyses.

4.6 Conclusion

This is the first systematic review of observational studies that examined the relationship between SES and HCA and SES and QoL in COPD. Despite the limited number of studies and the significant variability in design, participants and outcomes particularly in research examining health care access, the evidence that was found did not show a clear association between socio-economic deprivation and barriers to health care access. Although the evidence was inconclusive, it did not strongly support the common view that health care access is more impaired in lower socio-economic groups of the population in the case of COPD. The evidence from studies focusing on quality of life was limited due to quality issues but did provide some support for the association between deprivation and poorer quality of life in COPD when disease severity is controlled for. At present, insufficient information does not allow for more confident conclusions. A more significant finding emerging from this review was that very few studies focused solely on investigating associations between SES and HCA and/or QoL and thus did not employ sensitive and specific measures of these variables. Higher homogeneity in SES, HCA and QoL measures would contribute to more robust comparisons and stronger conclusions in increasing the understanding of these relationships.

Chapter 5

Hypotheses, aims and objectives of this thesis

5.1 Overview summary

The focus of this thesis is on the relationship between socio-economic status (SES) and health care access (HCA) and quality of life (QoL) in patients with COPD.

The hypotheses examined were whether lower socio-economic status was associated with:

a. more impaired access to health care access in terms of smoking cessation referral and

b. poorer quality of life in terms of perceived dyspnoea, fatigue, emotional function and mastery in patients with COPD.

Further measures of HCA and QoL were also examined to examine the impact of low SES on other outcomes. It was also hypothesized that the psychosocial variables in question – more positive illness perceptions, higher self-efficacy and higher levels of social capital – would be associated with higher socio-economic status, greater smoking cessation referrals and improved perceived levels of dyspnoea, fatigue, emotional function and mastery in COPD. In addition, these psychosocial variables were hypothesized to mediate the relationship between SES and smoking cessation and perceived dyspnoea, fatigue, emotional function, mastery in COPD. The aim of this research is to increase our knowledge of the ways these variables are associated and elucidate the mechanisms that underlie these relationships.

5.2 Primary outcomes

The primary outcomes of this study were: (a) smoking cessation referral rates in terms of HCA and (b) perceived dyspnoea, fatigue, emotional function, mastery, quality of life in terms of QoL.

5.3 Secondary outcomes

The secondary outcomes of this study included: (a) pulmonary rehabilitation awareness, referral, attendance and completion, consultant referral, regular spirometry, prescription patterns and hospital admissions in terms of HCA and (b) Hospital Anxiety and Depression Scale (HADS) in terms of QoL.

5.3 Objectives

In order to examine whether lower socio-economic status was related to more impaired health care access and poorer quality of life in patients with COPD and the possible underlying pathways of these relationships, the following objectives needed to be fulfilled:

- To examine whether lower socio-economic status was associated with lower smoking cessation referral rates in terms of HCA.
- To examine whether lower socio-economic status was associated with poorer perceived dyspnoea, fatigue, emotional function and mastery in terms of QoL.
- To examine whether lower socio-economic status was associated with (a) lower rates of pulmonary rehabilitation awareness, referral, attendance and completion rates, consultant referral, regular spirometry, prescription patterns and hospital admissions in terms of HCA and (b) higher scores on the Hospital Anxiety and Depression Scale (HADS) in terms of QoL.

- To examine whether higher disease severity, more negative illness perceptions, lower self-efficacy and lower levels of social capital were associated with lower socio-economic status, lower smoking cessation rates and poorer perceived dyspnoea, fatigue, emotional function, mastery more impaired health care access and poorer quality of life.

- To examine whether higher disease severity, more negative illness perceptions, lower self-efficacy and lower levels of social capital were associated with lower socio-economic status, pulmonary rehabilitation awareness, referral, attendance and completion rates, consultant referral, regular spirometry, prescription patterns, hospital admissions and Hospital Anxiety and Depression Scale (HADS) scores.

- To examine whether illness perceptions, self-efficacy or social capital mediated the relationship between socio-economic status and smoking cessation referral rates and perceived dyspnoea, fatigue, emotional function and mastery.

- To examine whether illness perceptions, self-efficacy or social capital mediated the relationship between socio-economic status, pulmonary rehabilitation awareness, referral, attendance and completion rates, consultant referral, regular spirometry, prescription patterns and hospital admissions in terms of HCA and (b) Hospital Anxiety and Depression Scale (HADS).

Chapter 6

Methods

6.1 Introduction

This chapter describes the methods used in this study. They include the design, setting, recruitment, overview of measures used, participants, sample size and power calculations, the stages of the study process and the analysis plan.

6.2 Design

The study was a cross-sectional, observational survey. It aimed to involve participants across the whole spectrum of COPD severity and SES. Previous research has provided ample evidence for the relationships between lower SES and lower health care access as well as poorer quality of life in various chronic illnesses. The systematic review that was conducted as part of this thesis (see Chapter Four) suggested that low SES was not consistently associated with worse healthcare access, but low SES was consistently associated with worse QOL in COPD. The review identified a small number of studies that examined the relationship between SES and HCA and QoL in patients with COPD. Statistical results on their associations were included in the analyses but were not the main aim of their research. This prevented from drawing stronger conclusions regarding the relationship between SES and HCA and SES and QoL in COPD. Thus, the present study focuses on investigating whether lower socio-economic status is associated with both lower HCA and poorer QoL in COPD. In addition, the fact that SES cannot fully account for the variation in HCA and QoL in COPD, suggested that other factors may be implicated and may aid in increasing our understanding of these relationships. The literature has provided evidence for an association between illness perceptions and self-efficacy and HCA and QoL in COPD and between SES, social capital and health. Therefore, a second level observation included the examination of the role of psycho-social factors i.e. illness perceptions,

self-efficacy, social capital as mediators in this relationship with the aim to elucidate the pathways underlying the relationship between SES and HCA and QoL in COPD.

6.2.1 Setting

In order to address the research question it was essential to achieve the best possible representation of disease severity and socio-economic status in patients with COPD. The most appropriate setting in which to recruit the study participants was the primary care setting because, in the UK, the majority of the population are registered with a GP practice and the majority of COPD patients are treated predominantly in general practice, particularly those with mild or moderate disease or those who are housebound. A sample in which the range of severity and SES is representative of the characteristics of people with SES was essential in the examination of associations between socio-economic status and health care access and quality of life in patients with COPD. A further reason for choosing GP practices was that COPD patients could easily be identified through the use of the practices' disease registers and that it is the only setting in which it is possible to seek to recruit all patients with a COPD diagnosis.

Ethical restrictions were addressed in the process of recruiting GP practices and COPD patients on their databases. Identification and recruitment of COPD patients from GP practices were performed by an administrator due to ethics restrictions regarding patient confidentiality which restricts access to third parties. Therefore, an administrator employed by one of the surgeries was seconded to the rest of the practices in order to identify and recruit COPD patients. This administrator was trained in data collection methods. In this way, co-operation of the GP practices was facilitated because the work required for this research study was conducted by the administrator and did not add to the workload of the practice staff. This workload included identification of COPD patients on practice databases and preparation of mail shots of the invitation letters for patient recruitment. Previously established relationships with the practices through research conducted in the past also contributed to increasing the likelihood of practice participation.

In order to minimise the risk of bias in recruitment further points were taken into consideration and addressed accordingly described in detail in sections 6.4 and 6.5. These points were: First, according to the literature an anticipated non-response rate of approximately 25-30% (Smith, 1995) was expected which would mean that about a quarter of the potential participants would choose not to participate. This could result in

the exclusion of a specific group of patients who would be of higher SES level, milder or more severe disease stage or younger age. These patients would probably still be in employment and too busy to respond. Second, hospitals or residential care homes were not considered as recruitment settings due to higher bias but also non-representative demographics. Hospital or care homes would include patients of advanced age and COPD severity and possibly patients who had already been offered referrals for specialists suggesting a potential bias in health care access in addition to disease severity, SES and advanced age. In addition, COPD patients resident in these facilities comprise a small proportion of the patient population. Due to them being resident outside of their homes it would also be difficult to apply SES criteria on them.

6.2.2 Practice characteristics and recruitment

GP practices in the London Boroughs of Lambeth and Southwark were stratified to participate in the study. A diagram detailing the stages of recruitment is presented in Figure 6.1. In order to ensure that a sample of GP practices representing patients from all the SES levels and COPD severity stages was obtained, a list of quality scores for each practice was developed. The quality scores were compiled based on: (a) the IMD score of the address of the GP practice used as a proxy for their patients' SES, and (b) on the quality of COPD care provided by each practice – based on the rates and frequency of spirometry conducted and the rates of COPD diagnosis. This information was based on South East London practice's scores on the Quality and Outcomes Framework (QOF).

Practices' IMD scores were classified into four categories ranging from 1 (low deprivation) to 4 (very high deprivation). Category 1 included IMD scores ≤ 30, category 2 scores 31-34, category 3 scores 35-39 and category 4 scores ≥ 40. Quality of COPD care was classified into A (excellent care) and B (lower quality care). The maximum number of combinations of scores between these categories was compiled to classify the practices into categories representing all IMD levels and quality scores (1A, 1B, 2A, 2B, 3A, 3B, 4A, 4B). For example, a GP practice score of 1A would denote that deprivation in its catchment area was low and the quality of COPD care it provided was excellent while a GP practice score 4B would indicate that it was located in a highly deprived area and its provision of COPD care was of low quality. This was done to ensure that a representative sample of patients would be recruited. A bias would be likely to occur if availability and quality of health care services provided by the surgeries

such as spirometry or prescriptions. The quality scores were developed to ensure randomisation would increase representativeness of GP practices in terms of deprivation and quality.

20 GP practices were randomly selected from the stratified groups of practices so that all 8 types of practices were represented in the study. Practice managers from selected practices were phoned to invite them to take part. The study was introduced and they were asked if their practices would be able to contribute. Information about the study was provided and any questions or concerns were answered. The managers who were interested in participating were then sent a detailed study information sheet, a sample of the patient information sheet and invitation letter to ensure they were appropriate for their patients (see Appendices B1 and B2). A decision to participate in the study or not was made after discussion between practice managers and the partners of the particular practice. The administrator assigned to the process of identifying and recruiting COPD patients visited the surgeries, identified the COPD patients in the practice's disease registers and checked whether they met the eligibility criteria. Eligible patients were sent a standardised invitation letter (see Appendix C1) on behalf of the practice. The invitation letter included an explanation and overview of the study as well as an invitation to participate with an attached reply slip, a pre-paid and pre-addressed envelope and a contact details form (see Appendices C3 and C4). 3 weeks after the initial invitation, patients were sent a reminder letter (see Appendix C5).

Reminder letters were sent to increase response rate (Wensing, Mainz, Kramme, Jung, & Ribacke, 1999). Patients were provided with the following options: (a) the provision of pre-paid and pre-addressed envelopes; (b) home visits that would solve issues like transportation especially for housebound patients; and (c) weekend or evening interview arrangements particularly for people who were still in employment. Patients returned their reply slips to the researcher using the pre-paid and pre-addressed envelope provided in the invitation pack sent by the practices. Consenting patients were given two options: (a) to return the completed contact details form and the reply slip indicating that they agree to participate in the research and have the researcher contact them to arrange an interview, or (b) phone the researcher themselves to arrange an appointment. Non-consenting patients were not contacted further.

In order to ensure equal distribution and representativeness of the sample in terms of SES levels and COPD severity stages, data for the first 30 participants were analysed. Analyses included descriptives, frequencies and distributions. No indication of any bias

in SES groups and COPD severity stages was observed. Therefore, practice and patient recruitment proceeded as planned.

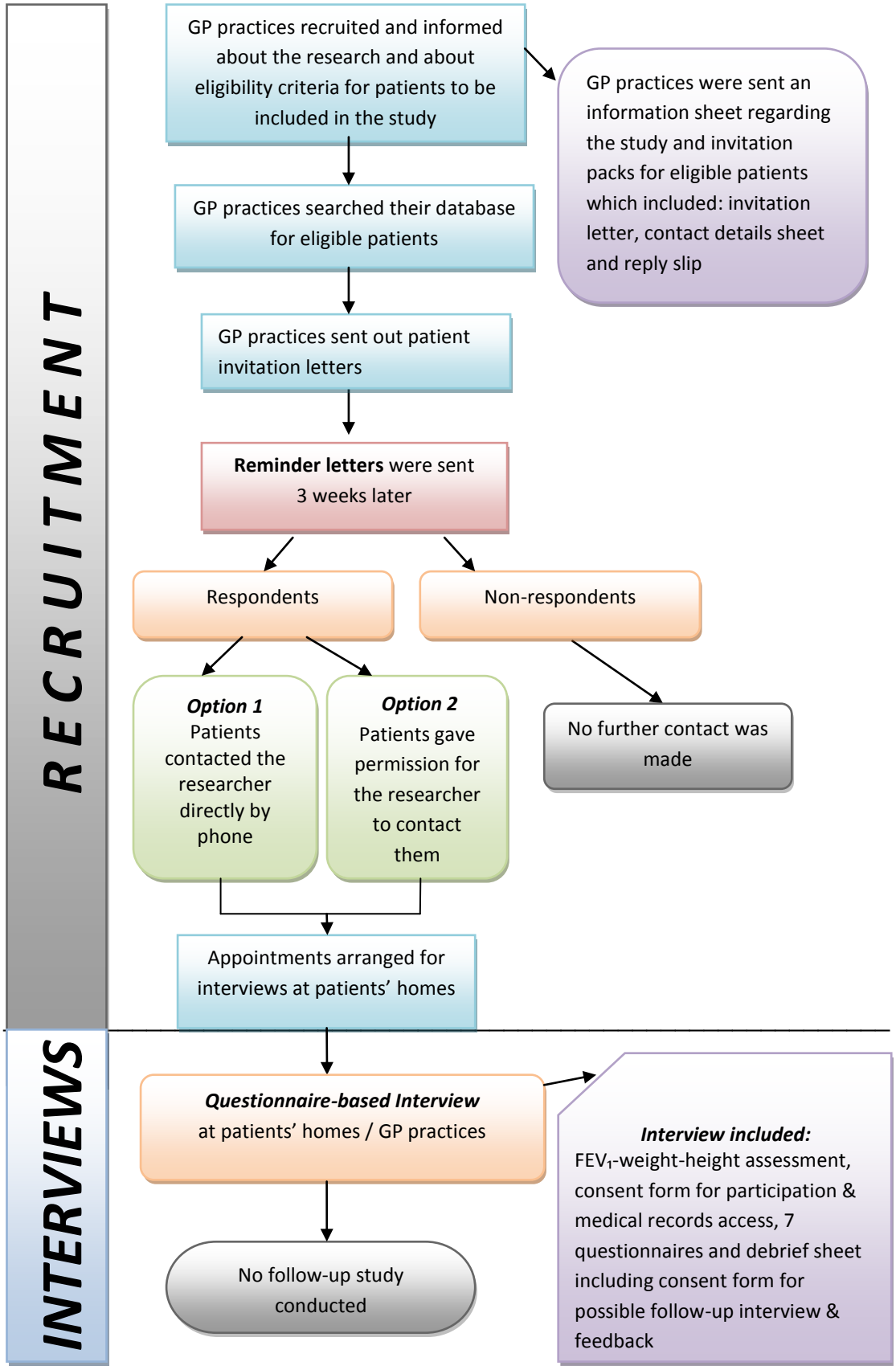
6.2.3 Patient characteristics and recruitment

Participants were recruited through GP practices for the reasons explained in previous sections. The majority of participants were interviewed in their home. A small number of patients preferred to be interviewed in their GP practice. Inclusion criteria for the study were that participants: (a) had to be aged over 40 years, (b) had to have received a diagnosis of COPD based on patient medical records and (b) had to be capable of understanding and responding to the questionnaire and interview questions in English. Illiterate participants were included as long as they were able to communicate in English. Participants were excluded if they: (a) were undergoing active treatment for cancer or (b) were suffering from ongoing major mental health problems such as acute psychosis, severe depression, alcoholism. Participants were identified through patient records from GP practices in the London Boroughs of Lambeth and Southwark. These boroughs were specifically chosen on three grounds: (a) high deprivation levels and thus higher likelihood of COPD incidence and the whole spectrum of SES and disease severity; (b) convenient geographical access due to area proximity and (c) easier access to GP practices and facilitated co-operation due to previous collaboration.

A pilot study was conducted to confirm whether the instruments and time demands were suitable for patients of varying ages, SES levels and disease severity grades (1 mild – 4 very severe). The pilot phase included the first 10 patients with COPD. Time and physical demands on participants were acceptable and results from analyses on frequencies and distribution of the scores on the measures used did not suggest that any changes were required. Patient demographics were collected and contained questions on age, sex, marital status, ethnicity, educational and income level and occupational status and was based on the one used in the Census 2001 (Census 2001, Office for National Statistics).

Ethical approval for this study was obtained from the Proportionate Review Sub-Committee of the East London REC 3 Research Ethics Committee on 27th May 2010 (REC 10/H0701/62) (see Appendix E).

Figure 6.1 GP practice and patient recruitment process



6.6 Interview Plan

Participants were provided with a brief introduction to the study in the beginning of the interview. Guidance on completion of the questionnaires was given and questions were answered. Each interview commenced with participants completing and signing the informed consent form (see Appendix D1) for participation in the study and for permission to the chief investigator to access their medical records if necessary. After patients' FEV_1, weight and height were assessed, the questionnaires were administered in the order mentioned above. In cases where patients had difficulty reading or completing the questionnaires, the questions were read out loud to them to make completion easier. A patient debrief sheet (see Appendix D9) concluded the interview. The debrief sheet thanked patients for participating in the study and included a request for written consent for participation in a follow-up study should one be arranged. An option to indicate whether participants would like feedback was also included. Patients were also informed of their right to withdraw from the study at any time without this affecting the care they received from their practices.

6.2.4 Measures overview

The measures used in this study relate to the assessment of SES, quality of life, and HCA, IPs, and self efficacy and are presented in Table 6.1.

Table 6.1 Type of assessment and measures used in the study

Type of Assessment	Measures/Instrument
Demographics	Age, sex, marital status, ethnicity, educational and income level, occupational status
Disease Severity	FEV_1 (spirometry), MRC dyspnoea scale, oxygen saturation levels, height, weight
Socio-economic Status (SES)	Income, education, occupation, IMD score
Social Capital	Social Capital Questionnaire
Illness Perceptions (IPs)	Illness Perceptions Questionnaire-Revised (IPQ-R) adapted to COPD
Health Care Access (HCA)	Client Service Receipt Inventory (CSRI) - included questions on GP attendance, prescriptions, consultant referrals, hospital admissions and exacerbations, detailed GP prescription data and information on GP referrals given for pulmonary rehabilitation and smoking cessation programmes
Quality of Life (QoL)	Chronic Respiratory Questionnaire (CRQ-SAS) and Hospital Anxiety and Depression Scale (HADS)
Self-efficacy	Generalised Self-Efficacy Scale (GSE)

a. Disease Severity

In order to confirm diagnosis of COPD, due to previously reported misdiagnosis rates ranging from 27% to 29% (Jones, Dickson-Spillmann, Mather, Marks, & Shackell, 2008), full spirometry was conducted. Spirometry also provided the data on FEV1 upon which the grading of severity is based according to international guidelines (GOLD). FEV1 is poorly correlated with symptoms. Symptoms are an important separate dimension of severity since they represent patient perceived severity. Therefore, the Medical Research Council (MRC) Dyspnoea Scale was an additional measure to assess COPD severity based on patients' perceived respiratory disability. Patients indicate the extent to which their breathlessness affects their mobility (see Appendix D5). The Medical Research Council (MRC) dyspnoea scale has been used for many years to assess the effect of breathlessness on daily activities and is a reliable and valid instrument in various respiratory diseases (Bestall, et al., 1999; Papiris, et al., 2005).

Physical status assessment also included oxygen saturation levels, height and weight. Oxygen saturation levels were used as an indicator for assessment of the role of long-term oxygen therapy. This was done to assess the proportion of patients who might have a need for long term oxygen therapy and to see if there was a difference in access to this assessment by SES. Height and weight were collected in order to be able to predict % of expected spirometry as a way of determining severity. They were used to calculate the predicted FEV_1 and FVC.

Spirometry was conducted according to American Thoracic Society Guidelines (American Thoracic Society, 1995). The MicroLoop VIASYS spirometer (Micro Medical Limited, Rochester, Kent, UK) was used known for its accuracy, precision and user-friendliness (Liistro, et al., 2006). All participants were assessed in identical fashion using standardised equipment i.e. Salter scales, pulse oximeter (Nonin Medical, Inc. Plymouth, USA) and stadiometer. The researcher conducting spirometry was trained in spirometry by attending a two-day training course held by a senior respiratory physiologist in King's College Hospital (KCH) Chest Unit. The course involved description of the spirometry process on the first day and practice spirometry sessions on patients with attendance of a team member of the unit on the second day.

b. Socio-economic Status (SES)

SES is commonly assessed by educational level, income level and occupational status. A detailed description on the ways SES has been conceptualised and assessed was presented in Chapter Two.

The assessment of SES in the current study was made on the basis of the three markers: education, income and occupational status based on evidence reported in the literature (see Chapter Two). The questions on education, income and occupational status were used because they were employed by the census but figures were adapted to reflect current data (Census 2001, Office for National Statistics) (see Appendices D2 and D8).

Education, income and occupational status are measures of different aspects of SES and are moderately correlated to each other as described in Chapter 2. In order to capture SES in all its dimensions such as at the neighbourhood level, the Index of Multiple Deprivation (IMD, 2010) Score was used as an additional marker. The IMD (2010) score consists of seven domains: (1) income deprivation; (2) employment deprivation; (3) health deprivation and disability; (4) education, skills and training deprivation; (5) barriers to housing and services; (6) living environment deprivation; and (7) crime. Each of the domains has a range of 0-100 (least deprived – most deprived). The IMD score used is an average of these scores. The underlying concept of the IMD (2010) is recognition and measurement of the different components of deprivation which are experienced by the population residing in a specific area. One or more domains can be assessed. The overall IMD score indicates the level of deprivation of a certain area on the basis of the averaged scores of all the individuals in the lower super output areas to which the IMD score applies. IMD (2010) scores were calculated based on the postcode of residence of the participants to supplement participants' SES assessment. The IMD 2010 was used instead of the IMD 2004 or 2007 because the first includes more up-to-date information and because new measures and source of data were introduced which made assessment of deprivation more accurate (The English Indices of Deprivation 2010).

c. Health Care Access (HCA)

Health care access is a domain that has been conceptualised and assessed in many and different ways in research. A detailed discussion of HCA and the issues surrounding it was presented in Chapter Two. In the current study HCA was operationalised as not only the availability of health care services provided but also the uptake of an offered service on the patient's side.

Retrospective information about the utilisation of health and social care services as well as other domains such as accommodation, employment and living situation has previously been collected with the Client Service Receipt Inventory (CSRI) (Chisholm, et al., 2000). The CSRI was developed by member of the Centre for the Economics of Mental and Physical Health and has been applied in various mental and physical health care evaluations. It can also be used to calculate service costs and total costs of care. The CSRI can be adapted to fit the aims and characteristics of the study in which it is used. In the present study, the Client Service Receipt Inventory (CSRI) was tailored appropriately (see Appendix D2). The CSRI included questions on GP attendance, prescriptions such as number and type of medication prescribed for each patient to establish under- or over-treatment, consultant referrals, hospital admissions, exacerbations, referrals for pulmonary rehabilitation and smoking cessation programmes. The importance of assessing these dimensions of health care access relies on their role in relation COPD outlined in Chapter Two.

Under-treatment is defined by the lack of prescription of remedies which guidelines indicate are indicated by symptoms or disease severity or both. For example, under-treatment would be not prescribing LABA+ICS for Grades 3 and 4 only (GOLD, 2011). LABA or LAMA is not a substitute for this. The lack of LABA or LAMA cannot be used to describe under-treatment except when patients have ongoing symptoms. Over-treatment is defined by prescribing LABA+ICS or ICS alone in Grades 1 and 2 (GOLD, 2011) (see Table 6.2).

Table 6.2 Treatments considered acceptable at each GOLD grade (2011 revision)

GOLD GRADE	FEV1% predicted	No treatment*	SAMA/SABA**	LAMA/LABA	ICS***
1 (mild)	≥ 80%	Yes	Yes	No	No
2 (moderate)	50% ≤FEV_1 < 80%	Yes	Yes	Yes	No
3 (severe)	30% ≤FEV_1 < 50%	Yes	Yes	Yes	Yes
4 (very severe	< 30%	Yes	Yes	Yes	Yes

*Without access to current symptom data (eg breathlessness) absence of treatment was considered appropriate in patients at all severity stages provided they had no exacerbations.
**SAMA/SABA Short-acting muscarinic or beta$_2$-agonist; LAMA/LABALong-acting muscarinic or beta$_2$-agonist; ICS Inhaled cortico-steroid
*** Treatment with LABA + ICS or ICS alone was acceptable for any patients with a diagnosis of asthma or history of asthma

The questions included in the CSRI variant were selected because using them would enable the assessment of HCA outcomes which are important in the management of COPD. For example, smoking cessation is the main intervention in order to slow down disease progression while pulmonary rehabilitation is important in improving patients' QoL. A detailed description of the reasons why these HCA are important in relation to COPD was provided in Chapter Two.

d. Quality of life (QoL)

In the current study QoL was assessed based on patients' physical, mental and social functioning with the use of two instruments: (a) the Chronic Respiratory Questionnaire (CRQ-SAS) and (b) the Hospital Anxiety and Depression Scale (HADS).

The CRQ is a valid and reliable measure of health status for patients with COPD (Guyatt et al., 1989; Griffiths et al., 2000). The self-administered version of the CRQ the CRQ-SAS was used because it is more user-friendly, easier for the patient to understand and to analyse. The CRQ-SAS is a reliable, stable and valid measure (Puhan, et al., 2007; Schünemann, Puhan, Goldstein, Jaeschke, & Guyatt, 2005). A further reason for using the self-administered version of the Chronic Respiratory Questionnaire (CRQ-SAS) was that it contained identical questions for all respondents and not individualised question as the original CRQ. The CRQ-SAS was standardised through inclusion of five identical questions regarding dyspnoea.

Despite the CRQ-SAS containing a section to assess emotional function, a more specific questionnaire was used to measure patients' mental status, the Hospital Anxiety and Depression Scale (HADS) (see Appendix D4). There is evidence that patients who suffer from or are at risk of developing anxiety or depression may experience a greater degree of dyspnoea (Janssen et al., 2010), an increased likelihood of exacerbations (Laurin et al., 2012) and poorer pulmonary rehabilitation outcomes (von Leupoldt et al., 2011). The Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) is an measures the risk for developing depression and anxiety in the medical out-patient clinic setting. It consists of two scales each of which contains 7 items one assessing anxiety risk and the other depression risk. The HADS is a reliable and effective self-administered instrument. However, it is emphasised that it should be employed for screening purposes and not for classification or diagnosis of psychiatric conditions (Cameron, Crawford, Lawton, & Reid, 2008; Mykletun, Stordal, & Dahl, 2001). The HADS was deemed appropriate for inclusion in the study due to its ability to assess risk of anxiety and depression in chronic illness populations in primary care settings (Bjelland, Dahl, Haug, & Neckelmann, 2002; Snaith, 2003).

e. Social capital

The role of social capital in relation to health and socio-economic status was outlined in Chapter Two. A questionnaire on social capital (Bullen & Onyx, 1998) was included in the measures in order to examine the role of social capital in the relationship between SES and health care access and quality of life in COPD (see Appendix D8). This questionnaire is a 50-item instrument that contains questions relevant to aspects of social capital such as citizenship, 'neighbourliness', social networks, civic participation as well as patterns and intensity of networks among people and the shared values which arise from these networks.

f. Illness perceptions

Illness perceptions were assessed with the Illness Perceptions Questionnaire-Revised (IPQ-R) (Moss-Morris et al., 2002) (see Appendix D6). The IPQ-R measures the eight components of illness perceptions: (1) identity, (2) consequences, (3) timeline, (4) control/cure, (5) cause, (6) cyclical timeline perceptions (7) illness coherence beliefs (patients' understanding of their condition) and (8) emotional representations (patients'

emotional responses to their illness). The IPQ-R is a reliable and robust instrument used in a variety of medical conditions such as vitiligo (Papadopoulos, Bor, Walker, & Legg, 2001), coronary artery disease (CAD) (Hirani, Pugsley, & Newman, 2006), cervical screening (Hagger and Orbell, 2005), cancer (Giannousi, Manaras, Georgoulias, & Samonis, 2010). An adjusted version of the IPQ-R (Moss-Morris et al., 2002) adapted to COPD (Scharloo et al., 2007) was used in the current study in order to address COPD patients' particular illness perceptions. Psychometric instruments have been widely used in patients with COPD with good internal consistency, test-retest reliability and construct validity (Moorer, Suurmeijer, Foets, & Molenaar, 2001; Metzemaekers, Berkhof, Uil, & van den Berg, 2012; Pokrzywinski, Meads, McKenna, Glendenning, & Revicki, 2009). The IPQ-R measures the cognitive and emotional adjustment to chronic illness. Therefore, its application to the present population was deemed appropriate.

g. Self-efficacy

Previous research suggested that self-efficacy mediated the relationship between pulmonary function and symptoms with quality of life and that it was linked to improved health status and quality of life in patients with COPD (Kohler et al., 2002; Bentsen et al., 2010). A detailed overview of self-efficacy was provided in Chapter Three.

The Generalised Self-Efficacy Scale (GSE) (see Appendix D7) was employed to measure patients' perceived self-efficacy level. The GSE (Schwarzer and Jerusalem, 1993) is a 10-item scale designed to assess optimistic self-beliefs used to cope with a variety of demands in life. The scaled score for each question ranges from 1 to 4. Higher scores indicate stronger self-efficacy. The GSE has high reliability, stability, and construct validity (Leganger, Kraft, & Ysamb, 2000).

6.2.5 Sample size and power calculations

A power calculation based on multiple regression analysis time aiming for 90% power to detect an R-squared of 0.1 was conducted. The adjusted sample size required to achieve this was 174 COPD patients. Given an anticipated response rate of 25-30% as well as a misdiagnosis rate of 27-29% (Jones et al. 2008), 1,104 patients were sent letters inviting them to participate. In addition, multiple regression analysis included up

to 10 independent variables with a significance level of 0.05. The variables tested were adjusted for additional 5 independent variables with the same R-squared, meaning that 5 further variables such as more dimensions of the illness perceptions or of social capital could be included in the analyses in order to examine more potential relationships without losing reliability.

6.3 Analysis plan

The analysis plan consisted of two phases. The first phase involved examining (a) frequencies of all the variables included in this study and (b) associations between SES and HCA and SES and QoL. The second phase involved examination of the psychosocial variables – illness perceptions, self-efficacy and social capital – as mediators in the statistically significant relationships that would be found between SES and HCA and SES and QoL. These two phases and the statical tests employed will be discussed in more detail in the following sections.

6.3.1 Frequency assessment of key variables and relationship between SES and HCA and SES and QoL

Frequencies and make comparisons between the measures examined – socio-economic status, illness perceptions, COPD severity, age, gender, ethnicity, health care access and quality of life will be assessed. To compare differences in HCA and QOL according to severity of COPD T-tests, Pearson's and Spearman's correlations, ANOVA and ANCOVA were conducted. Differences in HCA and QoL according to illness perceptions, self-efficacy and social capital were also assessed with the tets mentioned above. In all analyses, disease severity was adjusted for.

The main question was to assess whether lower SES predicted lower HCA, multiple logistic regression was used, whereas for poorer QoL multiple linear regression was the statistical test of choice. Linear regression was applied where the dependent variable was continuous, while logistic regression was used where the dependent variable was dichotomous – in this case QoL and HCA respectively. Finally, to examine whether lower SES, lower HCA and poorer QoL were associated with more negative illness perceptions, lower self-efficacy and social capital in COPD regression analyses were conducted. The relationship between SES, HCA, QoL and illness perceptions,

social capital, and self-efficacy were also assessed using Pearson's correlations and Spearman's rho.

6.3.2 Exploring the role of psychosocial variables as possible mediators in the relationships between SES and HCA and SES and QOL

The subsidiary question addressed in the present study was to explore the role of psychosocial variables – illness perceptions, self-efficacy and social capital – as possible mediators in the relationship between SES and HCA and SES and QOL. When the aim of the research is to acquire information on possible underlying mechanisms between variables rather than establishing the existence of an effect, mediation analysis is used. Mediation refers to the process in which the extent of the influence of an independent variable (IV) X on a dependent variable (Oswald & Medvei) Y through one or more mediator variables (M) is examined. For instance, self-esteem (X) has an impact on academic performance (Y) through the motivation to study (M). This could suggest that higher self-esteem would be associated with greater motivation to study which in turn would be related to better academic performance or vice versa depending on the direction and strength of the relationships between variables. In mediation, the IV and the mediator are correlated and so are the IV and the DV. This suggests that X causes Y through influencing M which causes the latter indicating the existence of a causal pathway that provides a link between these three variables. If M is causally located between X and Y and can explain their relationship (at least partially), then it is said that M mediates the relationship (Rozeboom, 1956). Alternatively, it can also be said that X has an indirect effect on Y through M. The mediator M can explain the way an observed effect occurred (Hoyle & Robinson, 2004).

a. Mediation, direct, and indirect effects

The most basic mediation model is the simple mediation model. As described above, simple mediation reflects a causal process where X is assumed to impact Y. Path c is termed the total effect of X on Y and quantifies this effect (see Figure 6.2). The causal effect of the IV on the mediator M is represented by path a (see Figure 6.3). The causal effect exerted on the DV by the mediator – controlling for the IV – is represented by

path b. Path c' depicts the causal effect of the IV – when controlling for the mediator M – on the DV. Thus, c' represents the direct effect of X on Y (see Figure 6.3).

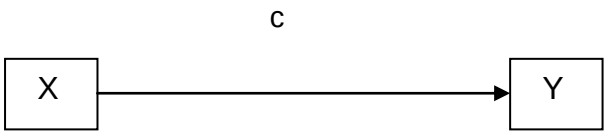


Figure 6.2 A simple mediation model depicting the total effect of X on Y

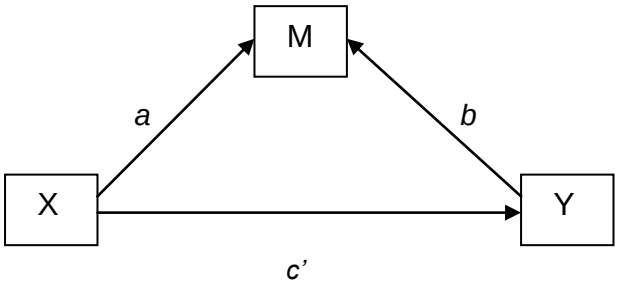


Figure 6.3 A simple mediation model depicting the causal and direct effect paths

The direct effect c' is different from the total effect c because the total effect is partialled out by the direct effect through removing the part of the causal effect that is shared with M. In other words, the direct effect c' represents only the X part of the causal effect on Y. Similarly, a direct effect is also represented by path b but describes the part of the causal relationship between the mediator and the DV. Through these models, it can be shown that the total effect of *X* on *Y* equals the sum of the direct and indirect effects

$$c = c' + ab \qquad (1)$$

Moreover, the difference between the total and the direct effects of *X* on *Y* equals the indirect effect

$$ab = c - c' \qquad (2)$$

b. Multiple mediation

Simple mediation models are not sufficient when examining the effect of variables through multiple mediators. In this case, multiple mediation analysis is employed (Preacher & Hayes, 2008). A single-step multiple mediator model (see Figure 6.4) is composed of several mediators but none of these mediators affects the other. In order to get from X to Y only one step is required through only one mediator. There are three types of effects in a multiple mediation model: (a) direct effects, (b) specific indirect effects and (c) total indirect effects.

Path c' represents the direct effect of X on Y and path b represents the direct effects of M on Y. The specific indirect effect of X on Y through the mediator j is defined as the result of the two unstandardised paths connecting X to Y through that mediator. For instance, the specific indirect effect of X on Y via M is quantified as a1b1. The sum of the specific indirect effects, Σi(aibi), i=1 to j is called the total indirect effect where j represents the number of proposed mediators. The direct effect of X on Y and the j specific indirect effects sum up to the total effect of X on Y or c=c' + Σi(aibi), i=1 to j (see Figure 6.4).

Multiple mediation analysis enables two actions: (a) to assess the existence and strength of the total indirect effect via the proposed mediators and (b) to assess the existence and strength of the specific indirect effects via individual mediators.

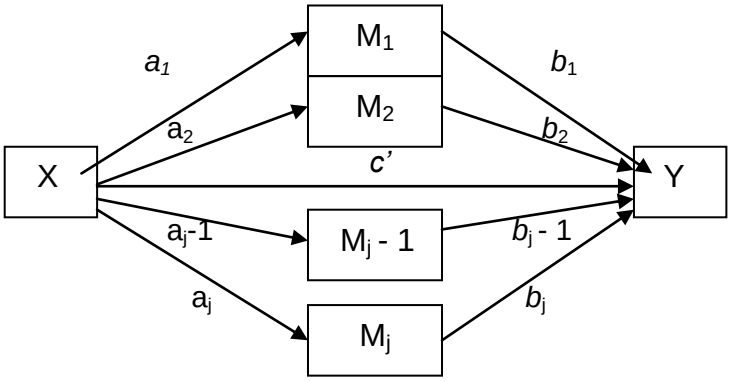


Figure 6.4 A single-step multiple mediators model depicting the direct, indirect and total effects (taken from Preacher & Hayes, 2008)

c. PROCESS

Multiple mediation analysis was employed using PROCESS which can be used for continuous outcomes as well as for dichotomous dependent variables – in the present

study, QOL and HCA respectively. It can also provide direct and indirect effects and can control for covariates such as disease severity in a variety of mediation models with one or more mediators. Bias corrected and percentile based bootstrap confidence intervals for conditional and unconditional indirect effects in mediation models are also available. Bootstrapping is a method used for estimating confidence intervals while making only very limited assumptions about the probability distribution that provided the data (Kirkwood & Sterne, 2003) The process relies on the assumption that the way the data were sampled from the population can be mimicked by taking repeated samples from the data. These samples can then be used to estimate standard errors and confidence intervals. The new samples are drawn with replacement from the original data. This involves selecting an observation at random from the original data and recording its value. Another observation is then selected at random from the same original data, regardless of which observation as selected first. This is repeated until a new dataset of the same size as the original is obtained. The samples are different from each other because some of the original observations are selected more than once whereas others are not selected at all. Bootstrapping involves fitting a regression model for the effect of a predictor variable on a predicted variable, controlling for a number of other variables and deriving a bootstrap confidence interval by repeating this regression on 1000 different bootstrap samples and recording the value of the regression coefficient estimated in each. The simplest way to obtain a 95% confidence interval for the difference between medians is the percentile method where the range within which 95% of these bootstrap differences lie is selected. The range extends from the 2.5^{th} percentile to the 97.5^{th} percentile of this distribution. Because the percentile method is not the most accurate method for estimating bootstrap confidence intervals, (a) bias corrected and (b) bias corrected and accelerated intervals have been developed of which the latter have been found to have the best properties. In the present analyses, bias corrected and accelerated confidence intervals were derived and a bootstrap sample of 5000 was set in order to increase accuracy of confidence intervals. One of the advantages of PROCESS compared to previous multiple mediation analysis models is that it provides the possibility to use multiple mediator variables in the model either in parallel (up to 10 mediators) or in sequence (up to 4 mediators linked together). In addition, using PROCESS, covariates such as gender, age or demographics can also be adjusted for in mediation. This can provide information on associations between mediator(s) and the dependent variables that are confounded by other factors even in the presence of experimental manipulation of the independent variable.

Chapter 7

Results I: Participant characteristics: demographics, health care access, quality of life, illness perceptions, social capital and self-efficacy

7.1 Practices used in participant recruiting

11 GP practices from the London Boroughs of Lambeth and Southwark were recruited. Characteristics of the practices, recruiting process and rates, and comparison of deprivation scores are presented in Table 7.1. The total number of participants decreased from 207 to 176 after spirometry assessment confirming diagnosis of COPD in 85% of participants indicating a misdiagnosis rate of approximately 15% (see Tables 7.1 and 7.2).

Table 7.1 GP practice characteristics and descriptive statistics

	Index of Multiple Deprivation (IMD) Score	Total Patient List Size	COPD patient List Size	Participants
GP Practice 1	53.05	10,087	109	27
GP Practice 2	16.87	6,934	50	14
GP Practice 3	37.51	10,611	163	25
GP Practice 4	31.92	8,645	129	28
GP Practice 5	39.71	9,712	122	27
GP Practice 6	38.06	10,500	130	14
GP Practice 7	46.8	7,298	92	17
GP Practice 8	41.87	10,079	70	8
GP Practice 9	24.66	14,304	104	15
GP Practice 10	22.6	6,637	43	6
GP Practice 11	20.43	18,370	135	26
Participation Descriptive Statistics				
Total number of invitation letters sent		1,104		
Total number of participating patients		286 (response rate ~26%)		
Total number of patients interviewed		207		
Total number of patients with COPD from the interviewed participants		176		
COPD misdiagnosis rate		~15%		
IMD Score Means and Comparisons				
Mean IMD Score Southwark		29.97		
Mean IMD Score Lambeth		31.15		
Mean IMD Score Southwark & Lambeth		30.56		
Mean IMD Score London		25.24		
Mean IMD Score of LSOAs in England		21.76		

7.2 Participants

7.2.1 Patient demographic characteristics

Demographic details including participant income level, educational attainment, occupational class and IMD scores were collected and are presented in Table 7.2.

Table 7.2 Patient Demographic Characteristics

Total number of participants	N=176		
Gender	Males	n= 108 (61.4%)	
	Females	n=68 (38.6%)	
Age (years)	Range 42 – 94	Mean=69 (*SD:* 11)	
Ethnicity	White British		78.4%
	White Other		11.4%
	Black Caribbean		6.8%
	Black African		1.7%
	Other		1.7%
Educational Level	No formal education		1.1%
	Primary School		3.4%
	Secondary School		71.6%
	3rd Level Certificate/Diploma		11.9%
	University Degree		6.8%
	Postgraduate Qualification		5.1%
Household income level per week (based on national quintiles of household income per week)	Income level 1 (£0-244pw)		44.3%
	Income level 2 (£245-339pw)		29%
	Income level 3 (£340-451pw)		9.1%
	Income level 4 (£452-625pw)		6.3%
	Income level 5 (£626+pw)		11.4%
Occupational Status	Retired		70.5%
	Unable to work due to illness		16.5%
	Unemployed		2.3%
	In paid work (FT/PT)		10.8%
Occupational Position (last job held)	Manager		10.4%
	Foreman/Supervisor		25.4%
	Employee		45.1%
	Self-employed		19.1%
Living Arrangements	Living alone		39.8%
	Living with partner		30.7%
	Living with children		8%
	Living with partner and children		7.4%
	Extended/blended family (e.g. living with children's family)		10.2%
	Living with friends		2.3%
	Other (e.g. sheltered housing)		1.7%
Marital Status	Married/living with a partner		42%
	Divorced/separated		17.6%
	Widowed		21.6%
	Single		18.8%
Index of Multiple Deprivation (IMD) Score	Range 6.8 – 59	Mean =33.5	(*SD:* 10.9)

In order to acquire more details on the pattern of the relationship between age and the distribution of participant SES characteristics, a sub-analysis was conducted. Mean ages of participants in each socio-economic status subcategory of education, occupational class, weekly household income and IMD score are presented in Table 7.3. Due to limited numbers of participants in certain SES sub-categories, levels were merged into new groups with the aim to increase power in the main analyses to follow. For instance, income levels 2 and 3 formed income level group 2. Income levels 4 and 5 were merged into income level group 3 representing the least deprived group of participants. Educational attainment was divided into two levels – pre-secondary and post-secondary. Occupational class was classified according to the three-class version described in the National Statistics Socio-economic Classification (NS-SEC rebased on the SOC2010) (Office for National Statistics, 2010). Ref IMD quintiles 4 and 5 had low number of participants and were merged into one group representing the least deprived participant group while participant numbers in the rest of the quintile groups were sufficient for the main analyses (see Table 7.3).

Table 7.3 Mean ages of participants in each socio-economic status subcategory of education, occupational class, weekly household income and IMD score

	Mean age (SD)	N (Total N=176)
Income level		
Income level group 1 (level 1 - most deprived)	67.37 (11.23)	78
Income level group 2 (levels 2 & 3)	72.43 (10.81)	67
Income level group 3 (levels 4 & 5 - least deprived)	65.42 (8.63)	31
Educational level		
Pre-secondary	68.95 (11.02)	103
Post-secondary	68.96 (10.97)	73
Occupational Class		
Class 1 (Higher managerial /administrative & professional occupations)	69.59 (10.37)	39
Class 2 (intermediate occupations	69.16 (11.56)	38
Class 3 (routine & manual occupations	68.63 (11.06)	99
IMD		
IMD quintile 1 (most deprived)	67.09 (10.96)	90
IMD quintile 2	71.03 (10.50)	58
IMD quintile 3	70.95 (12.01)	21
IMD quintiles 4 & 5 (least deprived)	69.71 (9.48)	7

7.2.2 Patient physical measures and disease severity characteristics

Details on patient characteristics such as COPD severity grading, MRC breathlessness score, FEV_1% predicted, oxygen saturation, body mass index, co-morbidities, use of COPD medications and smoking history are presented in Table 7.4.

Table 7.4 Patient Physical Characteristics/Disease Severity Frequencies

FEV_1% thresholds and grades (GOLD)	Grade 1 (mild)	FEV1 ≥ 80% predicted
	Grade 2 (moderate)	50% ≤ FEV1 < 80% predicted
	Grade 3 (severe)	30% ≤ FEV1 < 50% predicted
	Grade 4 (very severe)	FEV1 < 30% predicted or FEV1 < 50% predicted plus chronic respiratory failure
FEV_1% predicted* in the present study	Range: 15-109 Mean=59.3 (*SD:* 19.7)	
GOLD severity grading	1 (mild)	14.8%
	2 (moderate)	50.6%
	3 (severe)	29.5%
	4 (very severe)	5.1%
Medical Research Council (MRC) Breathlessness score	1	6.8%
	2	36.9%
	3	15.9%
	4	19.3%
	5	21%
Oxygen saturation	Range: 68-100 Mean=94.9 (*SD:* 3.7)	
Body Mass Index (BMI)	Range: 13.7-52.1 Mean=26.7 (*SD*: 6)	
Co-morbidities	Yes	71%
	No	29%
Use of COPD medications	Yes	96%
	No	4%
Smoking history		
Current smokers		34.8%
Past smokers		60.7%
Never smokers		4.5%

*$FEV_{1\%}$ predicted is used to classify severity of COPD. A mean FEV_1 predicted of 59.3 would be categorised as Grade 2 (moderate) COPD

7.2.3 Health care access

a. Prescriptions

Inhaled medication was prescribed to the majority of patients with COPD. Combination inhaled long-acting beta-agonists and corticosteroids (abbrev. LABA+ICS) were prescribed to the majority of patients although they were only indicated in those with a history of asthma and those in Gold Grades 3 (30%) and 4 (5%). Prescriptions for oral medication were less frequently reported. Participants were categorised according to treatment appropriateness i.e. under-, over- or appropriately treated (White et al., 2013). Prescription patterns and treatment appropriateness are presented in Table 7.5.

Table 7.5 Prescription Medication Frequencies

Inhaled Medication	
Medication Type	**Percentage of patients prescribed the drug**
Inhaled short-acting beta-agonists (SABA)	80.1%
Inhaled long-acting beta-agonists (LABA)	8%
Inhaled short-acting antimuscarinic bronchodilators (anticholinergic) (SAMA)	6.8%
Inhaled long-acting antimuscarinic bronchodilators (LAMA)	54%
Inhaled corticosteroids (ICS) and SABA	11.4%
Inhaled combination long-acting bronchodilators and corticosteroids (LABA +ICS)	60.2%
Oral medication	
Oral corticosteroids	2.8%
Theophyllins	1.7%
Mucolytics	3.4%
Oral antibiotics	4.5%
Other medications (Montelukast, Singulair® or zafirlukast - Accolate®)	1.1%
Oxygen	1.1%

Treatment appropriateness			
	Total n=176		
Appropriately treated	Yes	n=85	(48.3%)
	No	n=91	(51.7%)
Over-treated	Yes	n=62	(35.2%)
	No	n=114	(64.8%)
Under-treated	Yes	n=47	(26.7%)
	No	n=129	(73.3%)

b. Spirometry assessment, monitoring, referrals, exacerbations and hospitalisations

More than half of the participants (57.4%) reported that they had spirometry regular (every 3, 6 or 12 months). 15.3% attended the hospital for consultant follow-ups, over half of which (9.1%) were carried out bi-annually. The majority of patients were monitored by their GP (80.7%) or their nurse (9.7%). 85.8% reported that they had at least one exacerbation since being diagnosed with COPD. 28.6% had been admitted to hospital with a problem relating to their COPD. Frequencies are presented in Table 7.6.

Half the participants were aware of the existence of pulmonary rehabilitation (PR) courses. The most common source of information about PR was their GPs (21.6%). Other sources of information about PR included practice nurses and friends, family, internet (see Table 7.6). Fewer than half (39.2%) of all patient interviewed were offered/given a referral for pulmonary rehabilitation and 32.4% of those referred attended the programme.

Table 7.6 Health Care Access Frequencies

Smoking referral given	Yes	47.7%
	No	33.9%
Regular spirometry	Yes	57.4%
	No	42%
Frequency of spirometry	Every 6 months	26.1%
	Once a year	31.8%
	When necessary	42%
Hospital referral	Yes	15.3%
	No	84.7%
Frequency of hospital appointments	Every 3 months	1.1%
	Less than 3 months	1.1%
	N/A	86.9%
	Don't know	0.6%
	Every 6 months	9.1%
	Once a year	1.1%
COPD monitored by	GP	80.7%
	Nurse	9.7%
	Other (hospital,visiting specialist)	4%
	N/A	5.7%
Exacerbations	Yes	85.8%
	No	14.2%
Hospital admission in the past 3 months	Yes	28.6%
	No	70.3%
Awareness of pulmonary rehabilitation	Yes	50%
	No	50%
Informed by GPs		21.6%
Informed by nurse		14.2%
Informed by other (e.g. friends, family, internet)		12.5%
Don't remember		1.7%
Pulmonary rehabilitation referral	Yes	39.2%
	No	60.8%
Pulmonary rehabilitation attendance	Yes	32.4%
	No	67.6%

7.2.4 Participants' reported quality of life

a. Physical and emotional function

Quality of life was measured with the Chronic Respiratory Questionnaire (Standardised) (CRQ-SAS). Scores ranged from 1 (maximum impairment) to 7 (no impairment). The mean scores for quality of life (CRQ-SAS) were better in the present

sample compared to those reported in Dransfield et al. (2011). In contrast, dyspnoea scores were greater in this study in comparison to Dransfield et al. (2011). The means for dyspnoea and quality of life domain scores are shown in Table 7.7. The range of MRC Dyspnoea scores was 1 (no breathlessness) to 5 (severe breathlessness). For quality of life (CRQ-SAS) the range was 1 (more severe disease) to 7 (mild disease). Quality of life and MRC Dyspnoea score frequencies are also presented in Table 7.7.

Table 7.7 Quality of life (QoL) descriptive statistics

	Chronic Respiratory Questionnaire (CRQ-SAS)		
Quality of Life (QoL)	**Mean (*SD*)** (*Current sample)*	**Mean *(SE)****	**Range**
Dyspnoea	5.28 (*1.3*)	4.6 *(0.05)*	1-7
Fatigue	4.10 (*1.5*)	3.9 *(0.05)*	1-7
Emotional Function	4.92 (*1.3*)	4.5 *(0.05)*	1-7
Mastery	5.58 (*1.5*)	4.8 *(0.06)*	1-7
MRC Dyspnoea Score	3.11 *(1.3)*	1.7 *(0.04)*	1-5

*Means for CRQ-SA and MRC scores from Dransfield et al. (2011) in patients with mild to very severe COPD

b. Risk of depression and anxiety

Participants appeared relatively unaffected by risk of depression and anxiety. Scores were classified into: “normal” (0-7), mild (8-10), moderate (11-15) and severe (16-21) risk (Snaith & Zigmond, 1994). The few severe cases of depression and anxiety were most likely due to pre-existing psychological disturbances as suggested by patients’ medical history and report. For example, a number of patients were being treated for depression, schizophrenia or bipolar disorder before the emergence of COPD. Some patients reported a loss in their family or other personal issues that had a negative influence on their psychological state. Mean depression and anxiety scores were within the normal range in this group – anxiety M=5.66 (SD=4.4) (normal range 0-7) and depression M=4.25 (SD=3.9) (normal range 0-7). Anxiety and depression scores from the current study were compared with scores from previous studies (Withers et al., 1999; Von Leupoldt et al., 2011). Depression and anxiety frequencies and means are presented in Table 7.8.

Table 7.8 Depression and anxiety frequencies and means

	Frequency (n=176)	Percentage
Anxiety risk (as defined by Snaith & Zigmond, 1994)		
Normal	124	70.5%
Mild	22	12.5%
Moderate	24	13.6%
Severe	6	3.4%
Depression risk (as defined by Snaith & Zigmond, 1994)		
Normal	147	83.5%
Mild	15	8.5%
Moderate	8	4.5%
Severe	6	3.4%
	Mean (SD)	**Range**
Anxiety (current sample)	5.66 (4.4)	0-20
Depression (current sample)	4.25 (3.9)	0-16
Anxiety*	7.1 (4.4)	
Depression*	5.8 (3.1)	
	Pre-PR	**Post-PR**
Anxiety**	6.9 (4.2)	6.2(4.1)
Depression**	6.0 (3.8)	5.6(3.8)

*in patients with severe COPD (Withers et al., 1999) **in patients with moderate COPD (mean FEV_1 pred.=53.9%) (von Leupoldt et al., 2011)

7.2.5 Illness perceptions

Higher scores on identity, timeline, consequences, and timeline cyclical – compared to the remaining illness perceptions – reflected strong perceptions about the number of symptoms related to COPD, the chronic nature of the condition, its negative consequences on everyday life, and its cyclical nature (Scharloo, 2007). Higher scores on the dimensions of personal control, treatment control and illness coherence reflected positive beliefs about the degree of control over the illness and a personal understanding of COPD (Moss-Morris et al., 2002). The strongest illness perceptions within the data collected were related to the duration of their illness (i.e. timeline) and

the degree of personal control they felt they had over their COPD. Details are presented in Table 7.9.

Illness perceptions of the current patient group were compared with data from COPD patient groups from other studies. They were similar to those of Scharloo et al. (2007). However, participants in the present study had weaker identity, consequences, timeline cyclical, timeline chronic, and personal control beliefs but stronger treatment control and emotional representations compared to Scharloo et al.'s (2007) participants (see Table 7.9).

Table 7.9 Illness perceptions descriptive statistics

	Illness Perceptions Questionnaire-Revised (IPQ-R)		
Illness perception dimension	**Mean (*SD*)* n= 176**	**Range**	**Mean (*SD*)** n=171**
Identity	3.74 (*2.3*)	0-11	5.62 *(2.9)*
Consequences	17.24 (*4.2*)	7-28	19.25 *(6.1)*
Timeline Cyclical	11.50 (*3.2*)	4-20	12.13 *(4.9)*
Timeline Chronic	22.99 (*3.9*)	8-30	26.66 *(4.4)*
Personal Control	20.70 (*4.3*)	12-29	22.44 *(5.9)*
Treatment Control	16.15 (*2.4*)	6-24	14.29 *(3.7)*
Emotional Representations	15.40 (*4.3*)	6-30	14.13 *(7.0)*
Illness Coherence	18.31 (*3.4*)	10-25	----------

*Means and *SD* for illness perception in the present study; ** Means and *SD* for illness perception in Scharloo et al. (2007)

Participants also reported on the factors they perceived to be responsible for their COPD. The majority of participants cited smoking as their main perceived cause of their COPD. Pollution and ageing ranked second and third respectively (see Table 7.10)

Table 7.10 Participants' perceived causes of COPD

Perceived Causes of COPD	**Percentage of patients**
Smoking	59.1%
Pollution	10.8%
Ageing	2.3%

7.2.6 Social capital

Social capital scores ranged from 1 (low social capital) to 4 (high social capital) according to the range reported by Bullen and Onyx (2000). As a reference for comparison, means for social capital from (O'Brien, Burdsal, & Molgaard, 2004) who collected data in a metropolitan community in Midwestern United States are provided (see Table 7.11).

Work connections was the dimension of social capital reported with the highest mean score at 3.0 out of 4. However, this dimension was non-applicable for the majority of participants because they were either retired or unemployed. Participation in the local community was the dimension of social capital reported with the lowest mean score at 1.41 out of 4. The mean scores of all the social capital dimensions are presented in Table 7.11.

Table 7.11 Social capital descriptive statistics

Social capital dimension	**Present Sample Mean *(SD)***	**Midwestern US* Mean *(SD)***
Participation in Local Community	1.41 (*0.66*)	2.24 *(1.44)*
Social Agency/Social Proactivity	2.95 (*0.61*)	3.38 *(0.88)*
Feelings of Trust and Safety	2.43 (*0.72*)	3.00 *(0.94)*
Neighbourhood Connections	2.65 (*0.78*)	2.92 (*1.02)*
Family and Friends Connections	2.66 (*0.68*)	3.03 (*1.00)*
Tolerance of Diversity	2.91 (*0.72*)	3.37 *(0.87)*
Value of Life	2.79 (*0.88*)	3.15 *(0.90)*
Work Connections	3.00 (*1.05*)	3.63 (*0.70)*

*Mean scores and SD for social capital dimensions in O'Brien et al. (2004)

7.2.7 Self-efficacy

Self-efficacy was measured with the General Self-efficacy Scale. Scores range from 1 (lowest) to 4 (highest). Patients' means in the current results were relative high compared to means reported in previous studies (Schwarzer 1992; 1999). Details are presented in Table 7.12.

Table 7.12 Self-efficacy descriptive statistics

	Mean (*SD*)	Range
General Self-Efficacy (current sample)	3.29 (*5.9*)	1-4
Great Britain*	2.92 *(4.8)*	1-4
Self-efficacy score in 14 countries**	2.86 *(6.2)*	1-4

*based on arthritis patients with mean age 60 years (Schwarzer, 1992) ** based on a study by Ralf Schwarzer (1992, 1999)

7.3 Conclusion

COPD patients in this study were compared with other populations and patient groups in terms of SES, illness perceptions, self-efficacy, social capital, and quality of life. The participants in this study lived in more deprived areas when the IMD score of their locality was compared with the mean Index of Multiple Deprivation (IMD) in London and in England. They also held more positive illness perceptions and had stronger self-efficacy compared to other patient groups. Social capital in the present study was lower compared with reported means of the general population observed in Australia in 2000 (Bullen & Onyx, 2000).

Quality of life was better in comparison to other COPD patient groups reported in earlier studies. COPD patients in the present research reported lower dyspnoea, fatigue, better emotional function and greater perceived mastery for a comparable level of FEV_1. Perceived breathlessness was higher compared to previous studies.

To sum up, although participants SES appeared to be more deprived, their physical and psychological status was comparable to other patient and healthy populations.

Chapter 8

Results II: The influence of socio-economic status in the experience of COPD

8.1 Introduction and overview of the chapter

The results presented in this chapter follow a sequence starting from the two hypotheses outlined below. Following the hypotheses, associations between the variables examined in this thesis – SES, HCA, QoL, disease severity and the psychosocial variables (illness perceptions, self-efficacy and social capital) – are examined and findings are highlighted. The next section focuses on examination of the relationship between SES and HCA and SES and QoL in COPD. The final part of the chapter aimed to explore whether psychosocial variables (illness perceptions, self-efficacy and social capital) mediated the statistically significant relationships found between SES and HCA and SES and QoL. An overview of the results and a summary is provided at the end of the chapter. Diagrams are also presented as a visual representation of the findings due to the many associations found.

The hypotheses were as follows:

- Was lower socio-economic status associated with more impaired access to health care access in terms of smoking cessation referral?
- Was lower socio-economic status associated with poorer quality of life in terms of perceived dyspnoea, fatigue, emotional function and mastery in patients with COPD?

The primary outcomes of this study were: (a) smoking cessation referral rates in terms of HCA – referring to the first hypothesis outlined above and (b) perceived dyspnoea, fatigue, emotional function, mastery, quality of life in terms of QoL – referring to the second hypothesis outlined above. The secondary outcomes of this study included: (a) pulmonary rehabilitation awareness, referral, attendance and completion, consultant referral, regular spirometry, prescription patterns and hospital admissions in terms of HCA which refer to the first hypothesis stated above and (b) Hospital Anxiety and Depression Scale (HADS) in terms of QoL which refer to the second hypothesis stated

above. The role of psycho-social variables i.e. illness perceptions, self-efficacy and social capital as mediators in these relationships was also examined.

8.2 Associations between disease severity and health care access, quality of life, illness perceptions, self-efficacy, social capital and SES measures

The evidence outlined in Chapters Two and Three suggests that severity of COPD might be associated with HCA and QoL in COPD. COPD is linked to lower SES due to higher deprivation being associated with higher incidence, prevalence and morbidity of the disease. Thus, disease severity could be a confounder in the relationship between SES and HCA and SES and QoL in COPD. Preliminary analyses were conducted to examine whether disease severity was related to SES, HCA and QoL (Pearson's and Spearman's correlations and independent T-tests). In addition, all analyses were adjusted in order to eliminate any likelihood of residual confounding effects of disease severity.

a. Disease severity and health care access (HCA) variables

Patients' access to healthcare was not significantly associated with disease severity as defined by FEV_1% predicted except with respect to pulmonary rehabilitation awareness, pulmonary rehabilitation referral and over-treatment. Participants who had more severe COPD were more likely to have been aware of PR and more likely to have been referred for PR. Patients with less severe COPD were more likely to have been over-treated. No other HCA variables were significantly associated with disease severity (Table 8.1).

b. Disease severity and quality of life

Patients' quality of life was not significantly associated with disease severity in terms of lung function (FEV_1% predicted). Correlations between disease severity and QoL are presented in Table 8.2.

c. Disease severity and illness perceptions, self-efficacy and social capital

Patients' illness perceptions, self-efficacy and social capital were not significantly associated with disease severity with the exception of one illness perception dimension – timeline cyclical (r= 0.15, p=0.04). However, this correlation was very weak. Participants who had more severe COPD, perceived their illness to be following a cyclical course alternating between times of stability of symptoms and exacerbations. No other illness perceptions or social capital elements were significantly associated with disease severity (see Table 8.3).

d. Disease severity and SES measures

No significant associations were found between disease severity and SES measures (see Table 8.4)

Table 8.1 Differences in disease severity in terms of HCA (independent t-tests)

Health Care Access	**No** mean (M) FEV1% pred & (SD)	**Yes** mean (M) FEV1% pred & (SD)	**t (n) and p values**
Smoking cessation referral	M= 56.00 (*SD*= 21.57)	M= 60.60 (*SD*= 18.53)	t(140)=1.37, p=0.17
Hospital referral	M= 59.27 (*SD*= 19.55)	M= 59.44 (*SD*= 20.88)	t(174)=0.04, p=0.97
Regular spirometry	M= 57.87 (*SD*= 21.07)	M= 60.36 (*SD*= 18.64)	t(174)=0.83, p=0.41
PR awareness	**M= 62.28 (*SD*= 18.14)**	**M= 56.31 (*SD*= 20.81)**	**t(174)=-2.03, p=0.04**
PR referral	**M= 62.76 (*SD*= 19.11)**	**M= 53.93 (*SD*= 19.51)**	**t(174)=-2.97, p=0.003**
PR attendance	M= 57.31 (*SD*= 16.73)	M= 53.42 (*SD*= 20.09)	t(68)=-0.65, p=0.52
PR completion	M= 52.73 (*SD*= 10.95)	M= 53.67 (*SD*= 22.58)	t(55)=0.15, p=0.88
Hospital admission	M= 59.86 (*SD*= 19.45)	M= 57.88 (*SD*= 20.43)	t(174)=-0.60, p=0.55
Under-treatment	M= 59.92 (*SD*= 19.45)	M= 57.57 (*SD*= 20.46)	t(174)=-0.70, p=0.49
Appropriate treatment	M= 57.08 (*SD*= 19.68)	M= 61.67 (*SD*= 19.55)	t(174)=1.55, p=0.12
Over-treatment	**M= 53.79 (*SD*= 20.04)**	**M= 69.42 (*SD*= 14.42)**	**t(174)=5.42, p<0.001**

Table 8.2 Correlations between disease severity (as defined by FEV1 pred.) and quality of life (Pearson's correlations)

	Dyspnoea	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
FEV1 % Predicted	r= 0.10, p=0.17	r= -0.01, p=0.91	r= -0.02, p=0.85	r= 0.13, p=0.10	r= 0.06, p=0.42	r= 0.08, p=0.32

Table 8.3 Correlations between illness perceptions, self-efficacy, social capital and disease severity (Pearson's correlations)

Variables	FEV1 % Predicted
Illness Perceptions	
Identity	r= 0.03; p=0.72
Timeline chronic	r= -0.04; p=0.56
Consequences	r= -0.10; p=0.18
Personal Control	r= 0.07; p=0.39
Treatment Control	r= 0.02; p=0.80
Illness Coherence	r= -0.10; p=0.18
Timeline Cyclical	**r= 0.15; p=0.04**
Emotional Representations	r= 0.03; p=0.67
Self-efficacy	
Self-efficacy	r= 0.02; p=0.78
Social Capital	
Participation in Local Community	r= 0.03; p=0.67
Social Agency/Social Proactivity	r= 0.03; p=0.75
Feelings of Trust & Safety	r= 0.09; p=0.25
Neighbourhood Connections	r= 0.02; p=0.81
Family & Friends Connections	r= -0.04; p=0.57
Tolerance of Diversity	r= -0.06; p=0.41
Value of Life	r= -0.03; p=0.68
Work Connections	r= -0.11; p=0.66

Table 8.4 Correlations between disease severity and SES measures (IMD scores and quintiles, income level, educational level and occupational class) – Pearson's and Spearman's correlations

SES Measures	Disease severity (FEV_1% predicted)
IMD scores	r=-0.13; p=0.10
IMD quintiles	ρ=0.008; p=0.30
Income level	ρ=0.06; p=0.46
Educational level	ρ=0.06; p=0.44
Occupational class	ρ=0.003; p=0.97

8.3 Associations between individual SES measures

Different measures of SES (income level, educational level, occupational class and IMD score) were used in this study in order to capture as many aspects of socio-economic deprivation as possible. While there would be some overlap between what these SES measured, correlations were conducted to check for collinearity. Income level showed weak correlations with IMD scores and quintiles and a moderate correlation with educational level. Occupational class was not significantly correlated to any of the SES measures (see Table 8.5). Significant relationships between SES and HCA and QoL could be confounded by age. Therefore, differences in participant age were compared between levels of severity of the categories of SES measures. Mean age did not differ significantly according to SES except for income level where mean age was higher in middle income participants compared to low and high levels (Table 8.6).

Table 8.5 Correlations between individual SES measures (Spearman's rho)

(N=176)	**IMD score**	**IMD Quintiles**	**Income level**	**Educational level**	**Occupational Class**
IMD score	ρ=1	**ρ=-0.91**; p<0.001**	**ρ=-0.20**; p=0.008**	**ρ=-0.16*; p=0.03**	ρ=-0.006; p=0.94
IMD quintiles	**-0.91**; p<0.001**	ρ=1	**0.21**; p=0.006**	**0.19*; p=0.01**	-0.007; p=0.92
Income level	**-0.20**; p=0.008**	**0.21**; p=0.006**	ρ=1	**0.29**; p<0.001**	0.06; p=0.42
Educational evel	**ρ=-0.16*; p=0.03**	**ρ=0.19*; p=0.01**	**ρ=0.29**; p<0.001**	ρ=1	ρ=0.07; p=0.39
Occupational Class	ρ=-0.006; p=0.94	-0.007; p=0.92	0.06; p=0.42	ρ=0.07; p=0.39	ρ=1

Table 8.6 Differences in age between levels of severity in each of the categories of SES measures (IMD score, income, educational and occupational level)

IMD (Quintiles)	***Mean age***	***SD***	***N***	***F and p***
1 (most deprived)	67.1	10.96	90	F(3, 172)=1.83; p=0.14
2	71.0	10.50	58	
3	70.1	12.01	21	
4 (least deprived)	69.7	9.48	7	
Income Level	***Mean age***	***SD***	***N***	***F and p***
1 (most deprived)	67.4	11.23	78	**F(2, 173)=6.13; p=0.003**
2 (less deprived)	72.4	10.81	67	
3 (least deprived)	65.4	8.63	31	
Educational Level	***Mean age***	***SD***	***N***	***F and p***
Pre-secondary	68.95	11.02	103	F(1, 174)=0.000; p=0.99
Post-secondary	68.96	10.97	73	
Occupational Level	***Mean age***	***SD***	***N***	***F and p***
1 (high managerial)	69.6	10.37	39	F(2, 173)=0.12; p=0.89
2 (intermediate)	69.2	11.56	38	
3 (routine/manual)	68.6	11.06	99	

8.4 Associations between SES and Health Care Access

Lower SES (in terms of IMD score) was significantly associated with the primary HCA outcome (smoking cessation referrals) when adjusting for disease severity (see Table 8.7a). Lower SES in terms of educational attainment was significantly associated with one of the secondary HCA outcomes (regular spirometry) (see Table 8.7c) when

adjusting for disease severity. The relationship was not uniformly across all SES measures. SES in terms of income level and occupational class was not significantly associated with any primary or secondary HCA outcome. The remaining secondary measures were not significantly associated with any form of SES (income level, educational level, occupational class, IMD score) (see Tables 8.7b and 8.7d-8.7k). HCA measures did not differ significantly in terms of co-morbidities (Table 8.8).

Table 8.7a Relationship between SES and HCA (Smoking Cessation Referral) – unadjusted and adjusted for disease severity (logistic regression)

Smoking Referral

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.06	0.06
IMD Quintile 2	**0.44**	**0.43**	**0.21, 0.95**	**0.20, 0.93**	**0.04**	**0.03**
MD Quintile 3	**0.29**	**0.29**	**0.11, 0.85**	**0.01, 0.85**	**0.02**	**0.02**
IMD Quintile 4 (4+5)	0.92	0.84	0.16, 5.39	0.14, 4.98	0.92	0.85
IMD scores	**1.05**	**1.05**	**1.01, 1.08**	**1.02, 1.08**	**0.006**	**0.004**
Income Level 1*	**1**	**1**			**0.001**	**0.001**
Income Level 2 (2+3)	**0.23**	**0.21**	**0.10, 0.51**	**0.09, 0.48**	**0.000**	**0.000**
Income Level 3 (4+5)	**0.33**	**0.32**	**0.13, 0.85**	**0.12, 0.85**	**0.02**	**0.02**
Educational Level (comp. to lowest)	0.6	0.58	0.30, 1.18	0.29, 1.15	0.14	0.12
Occupational Class 3*	1	1			0.52	0.52
Occupational Class 1	1.60	1.56	0.68, 3.75	0.66, 3.68	0.28	0.31
Occupational Class 2	1.33	1.41	0.57, 3.09	0.60, 3.34	0.52	0.43

Table 8.7b Relationship between SES and HCA (Hospital/Consultant Referral) – unadjusted and adjusted for disease severity (logistic regression)

Hospital/Consultant Referral

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.54	0.54
IMD Quintile 2	1.68	1.68	0.68, 4.19	0.68, 4.19	0.26	0.26
IMD Quintile 3	1.20	1.20	0.30, 4.74	0.30, 4.75	0.80	0.80
IMD Quintile 4(4+5)	2.87	2.89	0.50, 16.65	0.50, 16.91	0.24	0.24
IMD scores	0.98	0.98	0.94, 1.01	0.94, 1.01	0.21	0.2
Income Level 1*	1	1			0.64	0.64
Income Level 2 (2+3)	0.98	0.98	0.41, 2.37	0.41, 2.37	0.97	0.97
Income Level 3 (4+5)	0.54	0.54	0.14, 2.03	0.14, 2.03	0.36	0.36
Educational Level (comp. to lowest)	1.15	1.15	0.51, 2.64	0.50, 2.64	0.73	0.74
Occupational Class 3*	1	1			0.79	0.79
Occupational Class 1	0.82	0.82	0.28, 2.44	0.28, 2.44	0.73	0.72
Occupational Class 2	1.27	1.27	0.47, 3.39	0.47, 3.42	0.64	0.64

Table 8.7c Relationship between SES and HCA (Regular Spirometry) – unadjusted and adjusted for disease severity (logistic regression)

Regular Spirometry

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1	1	1			0.66	0.62
IMD Quintile 2	1.20	1.22	0.62, 2.35	0.62, 2.39	0.59	0.56
IMD Quintile 3	0.72	0.73	0.26, 1.95	0.27, 1.98	0.51	0.53
IMD Quintile 4 (4+5)	1.91	2.06	0.40, 9.04	0.43, 9.82	0.42	0.37
IMD scores	1	1	0.98, 1.03	0.98, 1.03	0.88	0.79
Income Level 1*	1	1			0.27	0.24
Income Level 2 (2+3)	1.49	1.53	0.76, 2.91	0.78, 3.01	0.25	0.21
Income Level 3 (4+5)	1.91	1.93	0.82, 4.42	0.83, 4.50	0.13	0.13
Educational Level (refer. lowest)	**0.43**	**0.42**	**0.23, 0.79**	**0.22, 0.77**	**0.006**	**0.005**
Occupational Class 1	1	1			0.54	0.53
Occupational Class 2	0.74	0.76	0.35, 1.57	0.35, 1.62	0.43	0.47
Occupational Class 3	0.69	0.66	0.32, 1.48	0.31, 1.44	0.34	0.30

Table 8.7d Relationship between SES and HCA (Pulmonary Rehabilitation Awareness) – unadjusted and adjusted for disease severity (logistic regression)

Pulmonary Rehabilitation Awareness

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.46	0.41
IMD Quintile 2	1.69	1.78	0.87, 3.30	0.91, 3.51	0.12	0.10
IMD Quintile 3	1.09	1.12	0.42, 2.81	0.43, 2.95	0.86	0.82
IMD Quintile 4 (4+5)	0.90	1.02	0.19, 4.24	0.21, 4.91	0.89	0.98
IMD scores	0.99	0.99	0.96, 1.02	0.96, 1.01	0.47	0.32
Income Level 1*	1	1			0.83	0.89
Income Level 2 (2+3)	0.83	0.87	0.43, 1.59	0.45, 1.69	0.56	0.68
Income Level 3 (4+5)	0.85	0.86	0.37, 1.95	0.37, 1.99	0.69	0.72
Educational Level (comp. to lowest)	0.95	0.99	0.52, 1.74	0.54, 1.82	0.88	0.97
Occupational Class 3*	1	1			0.77	0.63
Occupational Class 1	0.99	1.04	0.47, 2.08	0.49, 2.22	0.98	0.91
Occupational Class 2	0.76	0.71	0.36, 1.62	0.33, 1.52	0.48	0.37

Table 8.7e Relationship between SES and HCA (Pulmonary Rehabilitation Referral) – unadjusted and adjusted for disease severity (logistic regression)

Pulmonary Rehabilitation Referral

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.88	0.78
IMD Quintile 2	1.31	1.40	0.67, 2.57	0.70, 2.80	0.43	0.34
IMD Quintile 3	1.06	1.11	0.40, 2.83	0.41, 3.06	0.90	0.84
IMD Quintile 4 (4+5)	1.30	1.61	0.27, 6.15	0.33, 7.88	0.75	0.56
IMD scores	0.99	0.99	0.97, 1.02	0.96, 1.02	0.61	0.36
Income Level 1*	1	1			0.83	0.69
Income Level 2 (2+3)	1.15	1.27	0.59, 2.24	0.64, 2.52	0.68	0.50
Income Level 3 (4+5)	0.88	0.89	0.37, 2.09	0.36, 2.16	0.77	0.79
Educational Level (refer. lowest)	0.85	0.89	0.46, 1.58	0.47, 1.67	0.61	0.7
Occupational Class 3*	1	1			0.43	0.24
Occupational Class 1	1.32	1.44	0.63, 2.79	0.67, 3.13	0.47	0.35
Occupational Class 2	0.71	0.62	0.32, 1.57	0.27, 1.42	0.40	0.26

Table 8.7f Relationship between SES and HCA (Pulmonary Rehabilitation Attendance) – unadjusted and adjusted for disease severity (logistic regression)

Pulmonary Rehabilitation Attendance

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.74	0.59
IMD Quintile 2	1.40	1.50	0.69, 2.82	0.73, 3.09	0.35	0.27
IMD Quintile 3	1.23	1.29	0.45, 3.40	0.45, 3.69	0.69	0.63
IMD Quintile 4 (4+5)	1.85	2.33	0.39, 8.83	0.47, 11.57	0.44	0.30
IMD scores	0.96	0.97	0.91, 1.02	0.92, 1.03	0.22	0.32
Income Level 1*	1	1			0.74	0.58
Income Level 2 (2+3)	1.26	1.39	0.63, 2.51	0.68, 2.84	0.52	0.36
Income Level 3 (4+5)	0.92	0.93	0.37, 2.29	0.36, 2.36	0.86	0.87
Educational Level (refer. lowest)	1.52	1.55	0.42, 5.54	0.42, 5.69	0.52	0.51
Occupational Class 3*	1	1			0.53	0.33
Occupational Class 1	1.31	1.42	0.61, 2.83	0.64, 3.15	0.49	0.39
Occupational Class 2	0.75	0.66	0.32, 1.73	0.28, 1.56	0.50	0.35

Table 8.7g Relationship between SES and HCA (Pulmonary Rehabilitation Completion) – unadjusted and adjusted for disease severity (logistic regression)

Pulmonary Rehabilitation Completion

Variable		Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	(N=30)	1	1			0.69	0.73
IMD Quintile 2	(N=23)	1.25	1.28	0.41, 3.86	0.41, 3.99	0.70	0.67
IMD Quintile 3	(N=7)	4.00	3.61	0.43, 37.55	0.38, 34.45	0.23	0.27
IMD Quintile 4 (4+5)	(N=3)	------	------	----------	----------	------	------
IMD scores		0.97	0.97	0.92, 1.03	0.92, 1.03	0.32	0.33
Income Level 1*		1	1			0.43	0.46
Income Level 2 (2+3)		0.55	0.57	0.18, 1.69	0.18, 1.79	0.29	0.34
Income Level 3 (4+5)		1.40	1.45	0.24, 8.24	0.24, 8.64	0.71	0.68
Educational Level (refer. lowest)		3.64	3.63	0.89, 4.79	0.89, 14.83	0.07	0.07
Occupational Class 3*		1	1			0.37	0.26
Occupational Class 1		2.76	3.47	0.67, 11.44	0.77, 15.64	0.16	0.11
Occupational Class 2		1.11	1.01	0.28, 4.51	0.24, 4.19	0.88	0.99

Table 8.7h Relationship between SES and HCA (Hospital Admission) – unadjusted and adjusted for disease severity (logistic regression)

Hospital Admission

Variable		Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	(N=57)	1	1			0.05	0.05
IMD Quintile 2	**(N=7)**	**0.37**	**0.37**	**0.16, 0.85**	**0.16, 0.86**	**0.02**	**0.02**
IMD Quintile 3	(N=89)	1.61	1.63	0.60, 4.31	0.61, 4.38	0.34	0.33
IMD Quintile 4 (4+5)	(N=20)	0.79	0.82	0.14, 4.30	0.15, 4.49	0.78	0.82
IMD scores		1.01	1	0.98, 1.04	0.97, 1.04	0.75	0.8
Income Level 1*		1	1			0.07	0.06
Income Level 2 (2+3)		1.78	1.81	0.87, 3.64	0.89, 3.71	0.11	0.10
Income Level 3 (4+5)		0.55	0.55	0.19, 1.62	0.19, 1.63	0.28	0.28
Educational Level (refer. lowest)		0.71	0.72	0.23, 2.18	0.23, 2.23	0.55	0.57
Occupational Class 3*		1	1			0.87	0.88
Occupational Class 1		0.80	0.81	0.34, 1.85	0.35, 1.88	0.60	0.62
Occupational Class 2		0.94	0.93	0.41, 2.15	0.40, 2.12	0.89	0.86

Table 8.7i Relationship between SES and HCA (Over-treatment) – unadjusted and adjusted for disease severity (logistic regression)

Over-treatment

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.43	0.47
IMD Quintile 2	1.37	1.37	0.68, 2.75	0.64, 2.93	0.38	0.42
IMD Quintile 3	2.18	2.09	0.81, 5.83	0.71, 6.18	0.12	0.18
IMD Quintile 4 (4+5)	0.87	0.62	0.16, 4.77	0.10, 3.72	0.87	0.60
IMD scores	1.01	1	0.98, 1.04	0.97, 1.04	0.75	0.8
Income Level 1*	1	1			0.36	0.52
Income Level 2 (2+3)	1.61	1.49	0.81, 3.22	0.71, 3.13	0.17	0.29
Income Level 3 (4+5)	1.51	1.50	0.63, 3.61	0.58, 3.91	0.35	0.40
Educational Level (refer. lowest)	0.71	0.72	0.23, 2.18	0.23, 2.23	0.55	0.57
Occupational Class 3*	1	1			0.42	0.55
Occupational Class 1	0.90	0.75	0.42, 1.94	0.32, 1.75	0.90	0.51
Occupational Class 2	0.57	0.63	0.25, 1.31	0.26, 1.54	0.57	0.31

Table 8.7j Relationship between SES and HCA (Appropriate Treatment) – unadjusted and adjusted for disease severity (logistic regression)

Appropriate Treatment

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.96	0.97
IMD Quintile 2	1.03	1.02	0.53, 2.01	0.52, 1.98	0.92	0.97
IMD Quintile 3	0.88	0.85	0.33, 2.32	0.32, 2.26	0.79	0.74
IMD Quintile 4 (4+5)	1.43	1.31	0.30, 6.75	0.28, 6.27	0.65	0.73
IMD scores	1.01	1	0.98, 1.04	0.97, 1.04	0.75	0.8
Income Level 1*	1	1			0.34	0.40
Income Level 2 (2+3)	1.52	1.46	0.79, 2.92	0.75, 2.83	0.22	0.26
Income Level 3 (4+5)	0.89	0.88	0.38, 2.06	0.38, 2.04	0.78	0.76
Educational Level (refer. lowest)	0.71	0.72	0.23, 2.18	0.23, 2.23	0.55	0.57
Occupational Class 3*	1	1			0.33	0.33
Occupational Class 1	1.69	1.64	0.80, 3.56	0.77, 3.47	0.17	0.20
Occupational Class 2	1.45	1.53	0.68, 3.07	0.72, 3.27	0.34	0.28

Table 8.7k Relationship between SES and HCA (Under-treatment) – unadjusted and adjusted for disease severity (logistic regression)

Under-treatment

Variable	Odds Ratio	Adjusted Odds Ratio	95% CI	Adjusted 95% CI	*P* value	Adjusted P Value
IMD Quintile 1*	1	1			0.99	0.99
IMD Quintile 2	1.03	1.03	0.48, 2.18	0.48, 2.21	0.95	0.93
IMD Quintile 3	0.96	0.97	0.31, 2.93	0.32, 2.97	0.94	0.96
IMD Quintile 4 (4+5)	1.15	1.20	0.21, 6.33	0.22, 6.64	0.87	0.84
IMD scores	1.01	1	0.98, 1.04	0.97, 1.04	0.75	0.8
Income Level 1*	1	1			0.39	0.42
Income Level 2 (2+3)	0.59	0.61	0.28, 1.27	0.28, 1.30	0.18	0.20
Income Level 3 (4+5)	0.92	0.92	0.37, 2.29	0.37, 2.30	0.86	0.87
Educational Level (refer. lowest)	0.71	0.72	0.23, 2.18	0.23, 2.23	0.55	0.57
Occupational Class 3*	1	1			0.37	0.35
Occupational Class 1	0.79	0.81	0.34, 1.83	0.35, 1.88	0.59	0.62
Occupational Class 2	0.52	0.50	0.21, 1.31	0.20, 1.28	0.17	0.15

Table 8.8 Associations between co-morbidities and HCA (Chi Square)

	HCA			
Co-morbidities	**Smoking Referral**	**Hospital/Consultant Referral**	**Regular Spirometry**	**Hospital Admission**
No	No=27.3% / Yes= 59.1%	No=93.3% / Yes=6.7%	No=40.0% / Yes=60.0%	No=40.0% / Yes=60.0%
Yes	No=36.2% / Yes=43.8%	No=81.7% / Yes=18.3%	No=43.5% / Yes=56.5%	No=43.5% / Yes=56.5%
X^2 and p values	$X^2(2, 174)=3.09$; p=0.21	$X^2(1, 176)=3.50$; p=0.06	$X^2(1, 176)=3.25$; p=0.20	$X^2(1, 176)=3.25$; p=0.20
Co-morbidities	**PR Referral**	**PR attended**	**PR awareness**	**PR completed**
No	No=62.2% / Yes=37.8%	No=66.7% / Yes=33.3%	No=51.1% / Yes=48.9%	No=13.3% / Yes=20.0%
Yes	No=60.3% / Yes=39.7%	No=67.9% / Yes=32.1%	No=49.6% / Yes=50.4%	No=11.5% / Yes=25.2%
X^2 and p values	$X^2(1, 176)=0.05$; p=0.82	$X^2(1, 176)=0.03$; p=0.88	$X^2(1, 176)=0.03$; p=0.86	$X^2(1, 176)=0.54$; p=0.77
Co-morbidities	**Over-treated**	**Appropriately Treated**	**Under-treated**	
No	No=66.7% / Yes=33.3%	No=44.4% / Yes=55.6%	No=73.3% / Yes=26.7%	
Yes	No=64.1% / Yes=35.9%	No=54.2% / Yes=45.8%	No=73.3% / Yes=26.7%	
X^2 and p values	$X^2(1, 176)=0.10$; p=0.76	$X^2(1, 176)=1.28$; p=0.26	$X^2(1, 176)=0.00$; p=0.99	

8.3 Associations between SES and QoL

Higher SES (in terms of income level) was significantly associated with better QoL (dyspnoea, fatigue, mastery, emotional functioning, anxiety and depression). Less deprived participants in terms of weekly household income level were more likely to report better QoL. Secondary outcome measures (anxiety and depression) were also related to SES in the same direction. Correlations were modest between 0.22-0.25 (see Tables 8.9a-8.9e). These relationships were unaffected when adjusting for disease severity (see Appendix F1).

Co-morbidities were not predictors of all quality of life dimensions – except for fatigue – either on their own or when controlling for SES. Patients without any co-existing illnesses were more like to report lower levels of fatigue (Table 8.10). Unadjusted analyses are presented in Appendix F2.

Table 8.9a Correlations between SES (IMD scores) and QoL – adjusted for disease severity (Pearson's partial correlations)

	Dyspnoea	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
IMD scores	r= 0.003; p=0.97	r= -0.04; p=0.64	r= -0.11; p=0.16	r= -0.02; p=0.76	r= 0.08; p=0.27	r= 0.10; p=0.20

Table 8.9b Differences in QoL according to SES (IMD quintiles) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**QoL**					
IMD quintiles	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	5.35 (0.14)	4.05 (0.16)	4.86 (0.14)	5.52 (0.15)	5.83 (0.47)	4.44 (0.42)
2	5.14 (0.18)	4.01 (0.19)	4.88 (0.17)	5.59 (0.19)	5.78 (0.59)	4.31 (0.52)
3	5.42 (0.29)	4.41 (0.32)	5.29 (0.28)	6.02 (0.32)	4.85 (0.98)	3.52 (0.86)
4 (least deprived)	5.09 (0.50)	4.40 (0.56)	5.03 (0.49)	4.83 (0.55)	5.05 (1.69)	3.47 (1.50)
F and p values	F(3, 171)=0.41; p=0.75	F(3, 171)= 0.49; p=0.69	F(3, 171)=0.68; p=0.56	F(3, 171)=1.32; p=0.27	F(3, 171)=0.33; p=0.81	F(3, 171)=0.41; p=0.75

Table 8.9c Differences in QoL according to SES (income level) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**QoL**					
Income Level	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	5.00 (0.15)	3.71 (0.16)	4.54 (0.14)	5.19 (0.16)	6.68 (0.50)	5.41 (0.43)
2	5.34 (0.16)	4.31 (0.18)	5.22 (0.15)	5.69 (0.17)	4.70 (0.54)	3.56 (0.47)
3 (least deprived)	5.85 (0.23)	4.60 (0.26)	5.26 (0.23)	6.31 (0.25)	5.20 (0.79)	2.82 (0.68)
F and p values	**F(2, 172)=4.85; p=0.009**	**F(2, 172)=5.61; p=0.004**	**F(2, 172)=6.59; p=0.002**	**F(2, 172)=7.43; p=0.001**	**F(2, 172)=3.90; p=0.02**	**F(2, 172)=6.94; p=0.001**

Table 8.9d Differences in QoL according to SES (educational level) – adjusted for disease severity (analyses of covariance - ANCOVA)

SES measure	**QoL**					
Educational level	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
1 (pre-secondary)	5.22 (1.33)	4.13 (1.52)	4.88 (1.38)	5.58 (1.48)	5.57 (4.98)	4.45 (4.11)
2 (post-secondary)	5.36 (1.33)	4.05 (1.39)	4.99 (1.16)	5.57 (1.44)	5.79 (3.58)	3.97 (3.66)
F and p values	F(1, 173)= 0.39; *p*= 0.53	F(1, 173)= 0.11; *p*= 0.75	F(1, 173)= 0.32; *p*= 0.57	F(1, 173)= 0.03; *p*= 0.87	F(1, 173)= 0.08; *p*= 0.78	F(1, 173)= 0.72; *p*= 0.40

Table 8.9e Differences in QoL according to SES (occupational class) – adjusted for disease severity (analysis of covariance - ANCOVA)

SES measure	**QoL**					
Occupational Class	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (high)	5.24 (0.21)	3.91 (0.24)	4.78 (0.21)	5.57 (0.24)	6.02 (0.71)	4.58 (0.63)
2 (medium)	5.15 (0.22)	4.19 (0.24)	5.30 (0.21)	5.59 (0.24)	4.44 (0.72)	3.13 (0.64)
3 (low)	5.34 (0.13)	4.13 (0.15)	4.84 (0.13)	5.57 (0.15)	6.00 (0.45)	4.55 (0.39)
F and p values	F(2, 172)=0.30; p=0.74	F(2, 172)=0.41; p=0.66	F(2, 172)=2.06; p=0.13	F(2, 172)=0.002; p=0.99	F(2, 172)=1.85; p=0.16	F(2, 172)=1.99; p=0.14

Table 8.10 Differences in QoL according to co-morbidities – adjusted for disease severity (analysis of covariance – ANCOVA)

	QoL					
Co-morbidities	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
No	5.55 (0.20)	**4.61 (0.22)**	5.10 (0.19)	5.62 (0.22)	5.65 (0.67)	3.89 (0.59)
Yes	5.19 (0.12)	**3.92 (0.13)**	4.87 (0.11)	5.56 (0.13)	5.67 (0.39)	4.37 (0.34)
F and p values	F(1, 173)=2.47; p=0.12	**F(1, 173)= 7.58; p=0.007**	F(1, 173)=1.07; p=0.30	F(1, 173)=0.05; p=0.83	F(1, 173)=0.001; p=0.97	F(1, 173)=0.51; p=0.48

8.4 Associations between SES and the psychosocial variables

8.4.1 SES and illness perceptions

Illness perceptions were significantly correlated with SES in terms of weekly household income level and educational attainment but not in terms of IMD quintiles, IMD scores, and occupational class.

Both weekly household income level and educational level were significantly associated with illness perceptions. Participants with higher weekly household income were more likely to report weaker identity, weaker perceived consequences, higher personal control, greater treatment control, weaker timeline cyclical and weaker emotional representations (Tables 8.11c). Participants with higher education (post-secondary) were more likely to report higher personal and treatment control regarding their COPD (see Table 8.11d). No other measure of SES (e.g. occupational level) was significantly associated with illness perceptions (see Tables 8.11a, 8.11b and 8.11e). These associations were not affected when adjusting for disease severity (see Appendix F3 for unadjusted analyses).

Table 8.11a Correlations between SES (IMD scores) and illness perceptions – adjusted for disease severity (Pearson's partial correlations)

	Identity	**Timeline Chronic**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
IMD Scores	r= 0.07; p=0.35	r= -0.07; p=0.39	r= 0.004; p=0.96	r= -0.07; p=0.37	r= -0.04; p=0.62	r= -0.06; p=0.46	r= 0.05; p=0.48	r= -0.03; p=0.71

Table 8.11b Differences in illness perceptions according to SES (IMD quintiles) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Illness Perceptions							
IMD quintiles	**Identity**	**Timeline Chronic**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	3.77 (0.25)	3.77 (0.07)	2.86 (0.07)	3.41 (0.08)	3.23 (0.05)	3.66 (0.07)	2.89 (0.08)	2.55 (0.08)
2	4.00 (0.30)	3.97 (0.09)	2.92 (0.09)	3.39 (0.09)	3.20 (0.06)	3.57 (0.09)	2.89 (0.10)	2.54 (0.10)
3	3.05 (0.51)	3.85 (0.14)	2.84 (0.15)	3.75 (0.16)	3.28 (0.11)	3.86 (0.15)	2.74 (0.17)	2.64 (0.16)
4 (least deprived)	3.41 (0.88)	3.46 (0.25)	2.79 (0.27)	3.60 (0.27)	3.46 (0.19)	3.85 (0.26)	2.92 (0.30)	2.78 (0.28)
F and p values	F(3, 171)=0.92; p=0.43	F(3, 171)=1.90; p=0.13	F(3, 171)=0.14; p=0.94	F(3, 171)=1.53; p=0.21	F(3, 171)=0.65; p=0.58	F(3, 171)=1.15; p=0.33	F(3, 171)=0.25; p=0.86	F(3, 171)=0.31; p=0.82

Table 8.11c Differences in illness perceptions according to SES (income level) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Illness Perceptions							
Income Level	**Identity**	**Timeline Chronic**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	**4.13 (0.26)**	3.78 (0.08)	**3.05 (0.08)**	3.35 (0.08)	**3.17 (0.05)**	**3.65 (0.08)**	**2.97 (0.09)**	2.67 (0.08)
2	**3.69 (0.28)**	3.92 (0.08)	**2.78 (0.08)**	3.41 (0.09)	**3.19 (0.06)**	**3.56 (0.08)**	**2.91 (0.10)**	2.55 (0.09)
3 (least deprived)	**2.87 (0.41)**	3.78 (0.12)	**2.63 (0.12)**	3.81 (0.13)	**3.48 (0.09)**	**3.92 (0.12)**	**2.56 (0.14)**	2.35 (0.13)
F and p values	**F(2, 172)=3.40; p=0.04**	F(2, 172)=0.88; p=0.42	**F(2, 172)=5.15; p=0.007**	F(2, 172)=5.12; p=0.007	**F(2, 172)=5.13; p=0.007**	**F(2, 172)=3.12; p=0.05**	**F(2, 172)=3.22; p=0.04**	F(2, 172)=2.27; p=0.11

Table 8.11d Differences in illness perceptions according to SES (educational level) – adjusted for disease severity (analysis of covariance - ANCOVA)

	Illness Perceptions							
Educational Level	**Identity**	**Timeline Chronic**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD*	*Mean (SD)*
1 (pre-secondary)	3.59 (0.23)	3.85 (0.07)	2.87 (0.07)	**3.35 (0.07)**	**3.13 (0.05)**	3.62 (0.07)	2.89 (0.08)	2.61 (0.07)
2 (post-secondary)	3.97 (0.27)	3.80 (0.08)	2.88 (0.08)	**3.59 (0.08)**	**3.37 (0.06)**	3.73 (0.08)	2.85 (0.09)	2.51 (0.08)
F and p values	F(1, 174)= 1.14; *p*= 0.29	F(1, 174)= 0.24; *p*= 0.62	F(1, 174)= 0.001; *p*= 0.98	**F(1, 174)= 4.56; *p*= 0.03**	**F(1, 174)= 11.45; *p*= 0.001**	F(1, 174)= 1.27; *p*= 0.27	F(1, 174)= 0.14; *p*= 0.71	F(1, 174)= 0.78; *p*= 0.38

Table 8.11e Differences in illness perceptions according to SES (occupational class) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Illness Perceptions							
Occupational Class	**Identity**	**Timeline Chronic**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (high)	4.15 (0.37)	3.84 (0.11)	2.83 (0.11)	3.36 (0.12)	3.22 (0.08)	3.58 (0.11)	2.80 (0.13)	2.65 (0.12)
2	3.30 (0.38)	3.93 (0.11)	2.93 (0.12)	3.45 (0.12)	3.28 (0.08)	3.80 (0.11)	2.87 (0.13)	2.52 (0.12)
3 (low)	3.76 (0.23)	3.80 (0.07)	2.87 (0.07)	3.49 (0.07)	3.22 (0.05)	3.64 (0.07)	2.91 (0.08)	2.56 (0.07)
F and p values	F(2, 172)=1.30; p=0.28	F(2, 172)=0.53; p=0.59	F(2, 172)=0.21; p=0.81	F(2, 172)=0.40; p=0.67	F(2, 172)=0.21; p=0.81	F(2, 172)=1.15; p=0.32	F(2, 172)=0.25; p=0.78	F(2, 172)=0.36; p=0.70

8.4.2 SES and self-efficacy

Self-efficacy was not significantly correlated with SES regardless of disease severity (see Tables 8.12a, b, c, d and e). Unadjusted analyses are presented in Appendix F4.

Table 8.12a Correlations between SES (IMD score) and general self-efficacy (GSE) – adjusted for disease severity (Pearson's partial correlations)

SES measures	**Self-efficacy (GSE)**
IMD Score (Pearson's r)	r= 0.03; p=0.67

Table 8.12b Differences in general self-efficacy (GSE) according to SES (IMD quintiles) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**Self-efficacy (GSE)**
IMD quintiles	*Mean (SE)*
1 (most deprived)	3.24 (0.06)
2	3.40 (0.08)
3	3.25 (0.13)
4 (least deprived)	3.05 (0.22)
F and p values	F(3, 171)=1.30; p=0.28

Table 8.12c Differences in general self-efficacy (GSE) according to SES (income level) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**Self-efficacy (GSE)**
Income Level	*Mean (SE)*
1 (most deprived)	3.22 (0.07)
2	3.26 (0.07)
3 (least deprived)	3.51 (0.11)
F and p values	F(2, 172)=2.88; p=0.06

Table 8.12d Differences in general self-efficacy (GSE) according to SES (educational level) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**Self-efficacy (GSE)**
Educational Level	*Mean (SD)*
1 (pre-secondary)	3.23 (0.06)
2 (post-secondary)	3.38 (0.07)
F and p values	F(1, 174)= 2.75; *p*= 0.10

Table 8.12e Differences in general self-efficacy (GSE) according to SES (occupational class) – adjusted for disease severity (analysis of covariance – ANCOVA)

SES measure	**Self-efficacy (GSE)**
Occupational Class	*Mean (SE)*
1 (high)	3.25 (0.09)
2 (medium)	3.52 (0.10)
3 (low)	3.21 (0.06)
F and p values	F(2, 172)=3.74; p=0.06

8.4.3 SES and social capital

Social capital was significantly associated with SES (as defined by IMD scores, IMD quintiles weekly household income, educational level and occupational class) (Tables 8.13a-e).

Participants with higher weekly household income were more likely to report higher social agency/social proactivity, stronger feelings of trust and safety, more family and friends connections and stronger value of life beliefs (Table 8.13c).

More educated participants (post-secondary) were more likely to report higher participation in local community activities and events and higher social agency/proactivity (Table 8.13d).

More deprived participants in terms of IMD score were more likely to report lower agency/social proactivity, weaker feelings of trust and safety, fewer neighbourhood connections and fewer family and friends connections (Table 8.13a).

Less deprived participants in terms of IMD quintiles were more likely to report higher social agency/social proactivity, stronger feelings of trust and safety, more family and friend connections and higher tolerance of diversity (Table 8.13b).

Occupational class was not significantly associated with most elements social capital except for social agency and family and friend connections (Table 8.13e). Participants belonging to the medium occupational class were more likely to be more socially proactive and have more family and friend connections compared to their counterparts in the low and high occupational classes. Results were similar when not adjusting for disease severity (see Appendix F5).

Multiple measures of SES (IMD score, income level, educational level and occupational class) were used in order to examine associations with HCA and QoL in COPD. Not all measures were found to be significantly associated with the outcome and psychosocial variables (HCA, QOL, illness perceptions, self-efficacy and social capital). However, the effects of the SES measures that reached statistical significance were supported by fairly consistent effects of other forms of SES in terms of direction of effect. An overview of the direction of the SES measures in relation to the outcome and psychosocial variables is provided in Tables 8.13f and 8.13g.

Table 8.13a Correlations between SES (IMD scores) and social capital – adjusted for disease severity (Pearson's partial correlations)

SES measures	Participation in Local Community	Social Agency/Proactivity	Trust and Safety	Neighbourhood Connections	Family & Friends	Tolerance of Diversity	Value of Life	Work Connections
IMD Scores *(Pearson's r)*	r= -0.09; p=0.13	**r= -0.17; p=0.01**	**r= -0.26; p<0.001**	**r= -0.18; p=0.03**	**r= -0.28; p<0.001**	r= -0.12; p=0.10	r= -0.001; p=0.89	r= -0.15; p=0.47

Table 8.13b Differences in social capital according to SES (IMD quintiles) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Social Capital							
IMD quintiles	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	1.36 (0.07)	**2.83 (0.06)**	**2.26 (0.07)**	2.55 (0.08)	**2.45 (0.07)**	**2.76 (0.08)**	2.74 (0.09)	2.88 (0.40)
2	1.44 (0.09)	**3.02 (0.08)**	**2.63 (0.09)**	2.75 (0.10)	**2.83 (0.09)**	**3.07 (0.09)**	2.85 (0.12)	2.61 (0.41)
3	1.46 (0.15)	**3.20 (0.13)**	**2.59 (0.15)**	2.72 (0.17)	**2.95 (0.14)**	**3.14 (0.16)**	2.91 (0.19)	3.90 (0.63)
4 (least deprived)	1.67 (0.25)	**3.12 (0.23)**	**2.58 (0.27)**	2.97 (0.30)	**3.06 (0.25)**	**2.92 (0.27)**	2.65 (0.33)	3.83 (1.08)
F and p values	F(3, 171)=0.56; p=0.64	**F(3, 171)=2.84; p=0.04**	**F(3, 171)=3.85; p=0.01**	F(3, 171)=1.29; p=0.28	**F(3, 171)=6.63; p<0.001**	**F(3, 171)=3.17; p=0.03**	F(3, 171)=0.34; p=0.80	F(3, 13)=1.23; p=0.34

Table 8.13c Differences in social capital according to SES (income level) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Social Capital							
Income Level	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (most deprived)	**1.38 (0.07)**	**2.83 (0.07)**	**2.29 (0.08)**	2.57 (0.09)	**2.54 (0.08)**	2.84 (0.08)	**2.58 (0.10)**	1.02 (1.02)
2	**1.28 (0.08)**	**2.96 (0.07)**	**2.52 (0.09)**	2.72 (0.10)	**2.63 (0.08)**	2.90 (0.09)	**2.96 (0.11)**	3.00 (0.45)
3 (least deprived)	**1.78 (0.12)**	**3.22 (0.11)**	**2.62 (0.13)**	2.70 (0.14)	**3.04 (0.12)**	3.13 (0.13)	**2.97 (0.16)**	3.17 (0.29)
F and p values	**F(2, 172)=6.43; p=0.002**	**F(2, 172)=4.91; p=0.008**	**F(2, 172)=3.26; p=0.04**	F(2, 172)=0.62; p=0.51	**F(2, 172)=6.53; p=0.002**	F(2, 172)=1.81; p=0.17	**F(2, 172)=4.24; p=0.02**	F(2, 14)=2.06; p=0.16

Table 8.13d Differences in social capital according to SES (educational level) – adjusted for disease severity (analysis of covariance - ANCOVA)

	Social Capital							
Educational Level	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
1 (pre-secondary)	**1.31 (0.06)**	**2.86 (0.06)**	2.44 (0.07)	2.60 (0.08)	2.66 (0.07)	2.84 (0.07)	2.75 (0.09)	2.76 (0.36)
2 (post-secondary)	**1.56 (0.08)**	**3.07 (0.07)**	2.43 (0.09)	2.72 (0.09)	2.66 (0.08)	3.02 (0.08)	2.86 (0.10)	3.24 (0.36)
F and p values	**F(1, 174)= 6.39; *p*= 0.01**	**F(1, 174)= 5.18; *p*= 0.02**	F(1, 174)= 0.003; *p*= 0.96	F(1, 174)= 1.04; *p*= 0.31	F(1, 174)= 0.002; *p*= 0.97	F(1, 174)= 2.72; *p*= 0.10	F(1, 174)= 0.58; *p*= 0.45	F(1, 15)= 0.90; *p*= 0.36

Table 8.13e Differences in social capital according to SES (occupational class) – adjusted for disease severity (analysis of covariance – ANCOVA)

	Social Capital							
Occupational Class	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*	*Mean (SE)*
1 (high)	1.33 (0.11)	**2.89 (0.10)**	2.36 (0.11)	2.57 (0.13)	**2.64 (0.11)**	2.85 (0.12)	2.63 (0.14)	2.55 (0.41)
2 (medium)	1.31 (0.11)	**3.16 (0.10)**	2.68 (0.12)	2.77 (0.13)	**2.90 (0.11)**	3.10 (0.12)	2.96 (0.14)	3.86 (0.45)
3 (low)	1.48 (0.07)	**2.89 (0.06)**	2.37 (0.07)	2.64 (0.08)	**2.58 (0.07)**	2.87 (0.07)	2.79 (0.09)	2.78 (0.39)
F and p values	F(2, 172)=1.37; p=0.26	**F(2, 172)=3.08; p=0.05**	F(2, 172)=2.96; p=0.06	F(2, 172)=0.63; p=0.53	**F(2, 172)=3.16; p=0.05**	F(2, 172)=1.59; p=0.21	F(2, 172)=1.32; p=0.27	F(2, 14)=2.65; p=0.11

Table 8.13f Direction of effects of the multiple measures of SES (IMD scores, income level, educational level, occupational class) with predictive variables (HCA & QoL)

Predicted variables	Lower SES			
	IMD score	Income level	Educational level	Occupational class
Health Care Access (HCA)				
Smoking referral	↑**	↑**	↑	↓
Hospital/consultant referral	↓	↑	↓	↓
Regular Spirometry	=	↓	↑**	↑
PR awareness	↓	↑	↑	↑
PR referral	↓	↓	↑	↓
PR attendance	↓	↓	↓	↓
PR completion	↓	↓	↓	↓
Hospital admission	↑	↑	↑	↑
Over-treatment	↑	↓	↑	↑
Appropriate treatment	↑	↑	↑	↓
Under-treatment	↑	↑	↑	↑
Quality of Life (QoL)				
Dyspnoea	↑	↑**	↑	↑
Fatigue	↓	↑**	↓	↑
Emotional function	↓	↓**	↓	↓
Mastery	↓	↓**	=	=
Anxiety	↑	↑*	↓	=
Depression	↑	↑**	↑	↑

**statistically significant at p<0.05 or p<0.001*

Table 8.13g Direction of effects of the multiple measures of SES (IMD scores, income level, educational level, occupational class) with psychosocial variables (illness perceptions, self-efficacy, social capital)

Predicted variables	Lower SES			
	IMD score	Income level	Educational level	Occupational class
Illness perceptions				
Identity	↑	↑ *	↓	↑
Timeline chronic	↓	↓	↑	↓
Consequences	↑	↑ **	↓	↑
Personal control	↓	↓	↓ *	↑
Treatment control	↓	↓ **	↓ **	↓
Illness coherence	↓	↓ *	↓	↓
Timeline cyclical	↑	↑ *	↑	↑
Emotional representations	↓	↑	↑	↑
General Self-Efficacy (GSE)	↑	↓	↓	↑
Social capital				
Participation in the community	↓	↓ **	↓ **	↑
Social agency/proactivity	↓ **	↓ **	↓ *	↓ *
Feelings of trust & safety	↓ **	↓ *	↑	↓
Neighbourhood connections	↓ *	↓	↓	↓
Family & friend connections	↓ **	↓ **	=	↓ *
Tolerance of diversity	↓	↓	↓	↓
Value of life	↓	↓ *	↓	↓
Work connections	↓	↓	↓	↓

**statistically significant at p<0.05 or p<0.001*

8.4.4 Overall summary

COPD patients' illness perceptions were not significantly associated with some measures of SES (IMD quintiles, IMD scores, occupational level) but they were with weekly household income level and educational level. More deprived participants (in terms of income level and educational attainment) differed in the way they thought and made sense of their COPD.

COPD patients did not differ significantly in their self-efficacy in terms of SES. More deprived participants were as likely as less deprived participants to have strong belief in their capabilities.

COPD patients were found to have significant differences with respect to social capital depending on their SES (in terms of IMD quintiles, IMD scores, income level and educational level) with the exception of occupational class. Less deprived participants were more likely to report higher social involvement, trust and safety as well as stronger social networks in comparison to more deprived participants. All analyses were adjusted for disease severity.

In general, stronger support was found for the relationship between social capital and SES than for self-efficacy and illness perceptions. The direction of effect of the SES measures was fairly consistent between the measures that reached statistical significant and the ones that did not in relation to the predictive variables examined. The following section will examine associations between illness perceptions, self-efficacy, social capital and HCA.

8.5 Associations between the psychosocial variables - illness perceptions, self-efficacy, social capital – and Health Care Access

8.5.1 HCA and illness perceptions

HCA was often significantly associated with illness perceptions regardless of disease severity (see Tables 8.14a and 8.14d). Participants who were offered smoking cessation referrals were more likely to report stronger emotional representations. Higher rates of specialist referral were associated with stronger illness identity and

stronger consequences beliefs. Higher awareness of PR programmes was associated with stronger identity beliefs, timeline, consequences, and emotional representations but weaker treatment control beliefs. Patients who received a referral for PR were more likely to report stronger identity, timeline and consequences and weaker treatment control beliefs.

Participants who had completed PR were more likely to report weaker consequences beliefs and stronger illness coherence. People with higher rates of hospital admission were more likely to report stronger timeline cyclical beliefs. Over-treated patients were more likely to report stronger emotional representations. Appropriately treated patients were more likely to report stronger perceived consequences of their COPD. Under-treated patients were marginally more likely to report weaker identity beliefs. Regular spirometry and PR attendance were not significantly associated with illness perceptions. Unadjusted analyses are presented in Appendix F6.

8.5.2 HCA and self-efficacy

HCA was not significantly associated with self-efficacy regardless of disease severity (see Tables 8.14b and 8.14e). Unadjusted analyses are presented in Appendix F7.

8.5.3 HCA and social capital

HCA was not significantly associated with social capital with the exception of smoking cessation referrals and over-treatment regardless of disease severity (see Tables 8.14c and 8.14e). Participants who were offered smoking cessation referrals were more likely to report weaker value of life views. Over-treated patients were more likely to report more family and friend connections. No other measure of HCA was significantly associated with social capital. Unadjusted analyses are presented in Appendix F8.

8.5.4 Summary

Illness perceptions in patients with COPD differed significantly according to their HCA. Participants with more negative cognitions and affect regarding their COPD (e.g. attributing more symptoms to COPD, perceiving it to have greater impact on their

everyday life) were more likely to have greater access to health care (e.g. more specialist/smoking cessation referrals) regardless of disease severity.

Patients with COPD did not differ significantly in terms of self-efficacy according to their HCA. Participants with higher belief in their capabilities had equal access to health care as participants with weaker beliefs in their capabilities regardless of disease severity.

HCA in COPD patients with respect to social capital did not show statistically significant differences, with the exception of smoking cessation and over-treatment. Patients with lower social capital were more likely to have been offered smoking cessation referral while patients with higher social capital were more likely to have been over-treated regardless of disease severity.

Stronger support was found for the role of illness perceptions compared to social capital with regard to HCA. No evidence was found for self-efficacy and HCA.

Table 8.14a Differences in HCA according to illness perceptions – adjusted for disease severity (analyses of covariance - ANCOVA)

ANCOVA	**Smoking Referral** *(adjusted means and SD)*	**Consultant Referrals** *(adjusted means and SD)*	**Regular Spirometry** *(adjusted means and SD)*	**PR awareness** *(adjusted means and SD)*
Identity	No: 3.69 (0.31)/Yes: 3.90 (0.26)	**No: 3.54 (0.19)/Yes: 4.85 (0.44)**	No: 3.81 (0.27)/Yes: 3.70 (0.23)	**No: 3.28 (0.24)/Yes: 4.21 (0.24)**
	F(1,139)= 0.27; *p*=0.60	**F(1,173)= 7.57; *p*=0.007**	F(1,173)= 0.09; *p*=0.77	**F(1,173)= 7.32; *p*=0.008**
Timeline Chronic	No: 3.94 (0.09)/Yes: 3.77 (0.07)	No: 3.83 (0.05)/Yes: 3.86 (0.13)	No: 3.77 (0.08)/Yes: 3.88 (0.07)	**No: 3.63 (0.07)/Yes: 4.03 (0.07)**
	F(1,139)= 2.13; *p*=0.15	F(1,173)= 0.05; *p*=0.83	F(1,173)= 1.30; *p*=0.26	**F(1,173)= 17.72; *p*<0.001**
Consequences	No: 2.86 (0.09)/Yes: 2.91 (0.08)	**No: 2.78 (0.06)/Yes: 3.38 (0.13)**	No: 2.83 (0.08)/Yes: 2.91 (0.07)	**No: 2.64 (0.07)/Yes: 3.10 (0.07)**
	F(1,139)= 0.22; *p*=0.64	**F(1,173)= 18.17; *p*<0.001**	F(1,173)= 0.59; *p*=0.44	**F(1,173)= 20.55; *p*<0.001**
Personal Control	No: 3.54 (0.09)/Yes: 3.49 (0.08)	No: 3.43 (0.06)/Yes: 3.55 (0.14)	No: 3.54 (0.08)/Yes: 3.39 (0.07)	No: 3.43 (0.08)/Yes: 3.47 (0.08)
	F(1,139)= 0.17; *p*=0.68	F(1,173)= 0.59; *p*=0.44	F(1,173)= 1.78; *p*=0.18	F(1,173)= 0.10; *p*=0.76
Treatment Control	No: 3.25 (0.07)/Yes: 3.26 (0.05)	No: 3.21 (0.04)/Yes: 3.34 (0.09)	No: 3.20 (0.06)/Yes: 3.25 (0.05)	**No: 3.32 (0.05)/Yes: 3.15 (0.05)**
	F(1,139)= 0.000; *p*=0.99	F(1,173)= 1.63; *p*=0.20	F(1,173)= 0.50; *p*=0.48	**F(1,173)= 5.47; *p*=0.02**
Illness Coherence	No: 3.66 (0.09)/Yes: 3.73 (0.07)	No: 3.65 (0.06)/Yes: 3.74 (0.13)	No: 3.65 (0.08)/Yes: 3.67 (0.07)	No: 3.60 (0.07)/Yes: 3.72 (0.07)
	F(1,139)= 0.40; *p*=0.53	F(1,173)= 0.44; *p*=0.51	F(1,173)= 0.04; *p*=0.85	F(1,173)= 1.38; *p*=0.24
Timeline Cyclical	No: 2.75 (0.10)/Yes: 2.93 (0.09)	No: 2.85 (0.06)/Yes: 2.99 (0.15)	No: 2.89 (0.09)/Yes: 2.86 (0.08)	No: 2.80 (0.08)/Yes: 2.95 (0.08)
	F(1,139)= 1.92; *p*=0.17	F(1,173)= 0.68; *p*=0.41	F(1,173)= 0.06; *p*=0.80	F(1,173)= 1.54; *p*=0.22
Emotional Representations	**No: 2.41 (0.09)/Yes: 2.68 (0.08)**	No: 2.53 (0.06)/Yes: 2.80 (0.14)	No: 2.47 (0.08)/Yes: 2.64 (0.07)	**No: 2.46 (0.08)/Yes: 2.68 (0.08)**
	F(1,139)= 4.83; p=0.03	F(1,173)= 3.36; p=0.07	F(1,173)= 2.61; p=0.11	**F(1,173)= 4.03; p=0.046**

ANCOVA	**PR referral** *(adjusted means and SD)*	**PR attendance** *(adjusted means and SD)*	**PR completion** *(adjusted means and SD)*	**Hospital Admission** *(adjusted means and SD)*
Identity	**No: 3.41 (0.22)/Yes: 4.26 (0.28)**	No: 3.57 (0.63)/Yes: 4.29 (0.30)	No: 4.61 (0.57)/Yes: 4.16 (0.34)	No: 3.73 (0.21)/Yes: 3.79 (0.33)
	F(1,173)= 5.48; *p*=0.02	F(1,67)= 1.07; *p*=0.31	F(1,54)= 0.46; *p*=0.50	F(1,173)= 0.02; *p*=0.89
Timeline Chronic	**No: 3.70 (0.06)/Yes: 4.04 (0.08)**	No: 3.91 (0.14)/Yes: 4.07 (0.07)	No: 4.02 (0.15)/Yes: 4.09 (0.09)	No: 3.87 (0.06)/Yes: 3.75 (0.09)
	F(1,173)= 11.46; *p*=0.001	F(1,67)= 0.96; *p*=0.33	F(1,54)= 0.17; *p*=0.68	F(1,173)= 1.15; *p*=0.29
Consequences	**No: 2.69 (0.07)/Yes: 3.16 (0.08)**	No: 3.05 (0.17)/Yes: 3.18 (0.08)	**No: 3.45 (0.15)/Yes: 3.08 (0.09)**	No: 2.82 (0.06)/Yes: 3.00 (0.10)
	F(1,173)= 20.34; *p*<0.001	F(1,67)= 0.42; *p*=0.52	**F(1,54)= 4.68; *p*=0.04**	F(1,173)= 2.25; *p*=0.14
Personal Control	No: 3.45 (0.07)/Yes: 3.45 (0.09)	No: 3.41 (0.20)/Yes: 3.44 (0.10)	No: 3.31 (0.18)/Yes: 3.48 (0.11)	No: 3.44 (0.06)/Yes: 3.47 (0.10)
	F(1,173)= 0.001; *p*=0.98	F(1,67)= 0.02; *p*=0.90	F(1,54)= 0.65; *p*=0.43	F(1,173)= 0.03; *p*=0.85
Treatment Control	**No: 3.31 (0.05)/Yes: 3.11 (0.06)**	No: 3.07 (0.13)/Yes: 3.11 (0.06)	No: 3.04 (0.12)/Yes: 3.13 (0.07)	No: 3.23 (0.04)/Yes: 3.24 (0.07)
	F(1,173)= 6.88; *p*=0.01	F(1,67)= 0.08; *p*=0.79	F(1,54)= 0.41; *p*=0.53	F(1,173)= 0.01; *p*=0.92
Illness Coherence	No: 3.61 (0.07)/Yes: 3.75 (0.08)	No: 3.69 (0.18)/Yes: 3.78 (0.08)	**No: 3.42 (0.16)/Yes: 3.92 (0.10)**	No: 3.67 (0.06)/Yes: 3.65 (0.10)
	F(1,173)= 1.74; *p*=0.19	F(1,67)= 0.24; *p*=0.63	**F(1,54)= 7.14; *p*=0.01**	F(1,173)= 0.04; *p*=0.85
Timeline Cyclical	No: 2.85 (0.08)/Yes: 2.92 (0.10	No: 2.70 (0.21)/Yes: 2.91 (0.10)	No: 2.82 (0.20)/Yes: 2.93 (0.12)	**No: 2.74 (0.07)/Yes: 3.21 (0.11)**
	F(1,173)= 0.29; *p*=0.59	F(1,67)= 0.78; *p*=0.38	F(1,54)= 0.19; *p*=0.66	**F(1,173)= 14.00; p<0.001**
Emotional Representations	No: 2.50 (0.07)/Yes: 2.68 (0.09)	No: 2.51 (0.19)/Yes: 2.69 (0.09)	No: 2.89 (0.17)/Yes: 2.62 (0.11)	No: 2.51 (0.06)/Yes: 2.72 (0.10)
	F(1,173)= 2.51; *p*=0.12	F(1,67)= 0.75; *p*=0.39	F(1,54)= 1.81; *p*=0.19	F(1,173)= 2.89; *p*=0.09

Table 8.14b Differences in HCA according to self-efficacy – adjusted for disease severity (analyses of covariance - ANCOVA)

ANCOVA	**Smoking Referral** *(adjusted means and SD)*	**Consultant Referrals** *(adjusted means and SD)*	**Regular Spirometry** *(adjusted means and SD)*	**PR awareness** *(adjusted means and SD)*
Self-efficacy	No: 3.28 (0.06)/Yes: 3.30 (0.07)	No: 3.34 (0.14)/Yes: 3.28 (0.07)	No: 3.13 (0.14)/Yes: 3.32 (0.08)	No: 3.31 (0.05)/Yes: 3.22 (0.08)
F and p values	F(1,173)= 0.02; p=0.89	F(1,67)= 0.15; p=0.70	F(1,54)= 1.58; p=0.21	F(1,173)= 0.82; p=0.37

ANCOVA	**Smoking Referral** *(adjusted means and SD)*	**Consultant Referrals** *(adjusted means and SD)*	**Regular Spirometry** *(adjusted means and SD)*	**PR awareness** *(adjusted means and SD)*
Participation in Local Community	No: 1.43 (0.09)/Yes: 1.37 (0.07)	No: 1.43 (0.05)/Yes: 1.32 (0.13)	No: 1.47 (0.08)/Yes: 1.36 (0.07)	No: 1.40 (0.07)/Yes: 1.43 (0.07)
	F(1,139)= 0.27; p=0.60	F(1,173)= 0.63; p=0.43	F(1,173)= 1.19; p=0.28	F(1,173)= 0.09; p=0.77
Social Agency/Social Proactivity	No: 3.04 (0.08)/Yes: 2.93 (0.07)	No: 2.94 (0.05)/Yes: 2.99 (0.12)	No: 2.97 (0.07)/Yes: 2.93 (0.06)	No: 2.89 (0.07)/Yes: 3.00 (0.07)
	F(1,139)= 1.16; p=0.28	F(1,173)= 0.15; p=0.70	F(1,173)= 0.23; p=0.64	F(1,173)= 1.53; p=0.22
Feelings of Trust & Safety	No: 2.47 (0.09)/Yes: 2.37 (0.08)	No: 2.44 (0.06)/Yes: 2.42 (0.14)	No: 2.45 (0.08)/Yes: 2.42 (0.07)	No: 2.48 (0.08)/Yes: 2.39 (0.08)
	F(1,139)= 0.64; p=0.42	F(1,173)= 0.009; p=0.92	F(1,173)= 0.06; p=0.80	F(1,173)= 0.58; p=0.45
Neighbourhood Connections	No: 2.74 (0.10)/Yes: 2.61 (0.09)	No: 2.65 (0.06)/Yes: 2.63 (0.15)	No: 2.64 (0.09)/Yes: 2.66 (0.08)	No: 2.68 (0.08)/Yes: 2.62 (0.08)
	F(1,139)= 0.84; p=0.36	F(1,173)= 0.02; p=0.88	F(1,173)= 0.02; p=0.90	F(1,173)= 0.30; p=0.59
Friends & Family Connections	No: 2.66 (0.09)/Yes: 2.66 (0.08)	No: 2.66 (0.06)/Yes: 2.64 (0.13)	No: 2.70 (0.08)/Yes: 2.64 (0.07)	No: 2.63 (0.07)/Yes: 2.70 (0.07)
	F(1,139)= 0.000; p=0.98	F(1,173)= 0.02; p=0.88	F(1,173)= 0.34; p=0.56	F(1,173)= 0.48; p=0.49
Tolerance of Diversity	No: 2.91 (0.10)/Yes: 2.99 (0.08)	No: 2.91 (0.06)/Yes: 2.95 (0.14)	No: 2.94 (0.08)/Yes: 2.90 (0.07)	No: 2.86 (0.08)/Yes: 2.96 (0.08)
	F(1,139)= 0.40; p=0.53	F(1,173)= 0.09; p=0.77	F(1,173)= 0.12; p=0.73	F(1,173)= 0.86; p=0.36
Value of Life	**No: 2.98 (0.12)/Yes: 2.59 (0.10)**	No: 2.82 (0.07)/Yes: 2.67 (0.17)	No: 2.85 (0.10)/Yes: 2.75 (0.09)	No: 2.88 (0.09)/Yes: 2.70 (0.09)
	F(1,139)= 6.75; p=0.01	F(1,173)= 0.65; p=0.42	F(1,173)= 0.59; p=0.45	F(1,173)= 1.76; p=0.19
Work Connections	No: 3.27 (0.46)/Yes: 2.91 (0.34)	No: 2.94 (0.26)/Yes: 3.94 (1.11)	No: 3.35 (0.39)/Yes: 2.72 (0.34)	No: 3.04 (0.32)/Yes: 2.92 (0.46)
	F(1,14)= 0.40; p=0.54	F(1,15)= 0.76; p=0.40	F(1,15)= 1.47; p=0.24	F(1,15)= 0.04; p=0.84

Table 8.14c Differences in HCA according to social capital – adjusted for disease severity (analyses of covariance - ANCOVA)

	PR referral *(adjusted means and SD)*	**PR attendance** *(adjusted means and SD)*	**PR completion** *(adjusted means and SD)*	**Hospital Admission** *(adjusted means and SD)*
Participation in Local Community	No: 1.43 (0.07)/Yes: 1.38 (0.08	No: 1.17 (0.17)/Yes: 1.42 (0.08)	No: 1.20 (0.16)/Yes: 1.49 (0.10)	No: 1.45 (0.06)/Yes: 1.31 (0.09)
	F(1,173)= 0.21; p=0.65	F(1,67)= 1.61; p=0.21	F(1,54)= 2.23; p=0.14	F(1,173)= 1.71; p=0.19
Social Agency/Social Proactivity	No: 2.93 (0.06)/Yes: 2.98 (0.07)	No: 2.91 (0.17)/Yes: 2.97 (0.08)	No: 2.85 (0.15)/Yes: 3.01 (0.09)	No: 2.97 (0.05)/Yes: 2.89 (0.09)
	F(1,173)= 0.35; p=0.56	F(1,67)= 0.10; p=0.75	F(1,54)= 0.95; p=0.33	F(1,173)= 0.52; p=0.47
Feelings of Trust & Safety	No: 2.45 (0.07)/Yes: 2.41 (0.09)	No: 2.20 (0.18)/Yes: 2.41 (0.08)	No: 2.37 (0.17)/Yes: 2.42 (0.10)	No: 2.47 (0.06)/Yes: 2.34 (0.10)
	F(1,173)= 0.12; p=0.73	F(1,67)= 1.18; p=0.28	F(1,54)= 0.08; p=0.78	F(1,173)= 1.30; p=0.26
Neighbourhood Connections	No: 2.64 (0.08)/Yes: 2.67 (0.10)	No: 2.35 (0.20)/Yes: 2.72 (0.10)	No: 2.45 (0.19)/Yes: 2.82 (0.12)	No: 2.59 (0.07)/Yes: 2.81 (0.11)
	F(1,173)= 0.06; p=0.81	F(1,67)= 2.80; p=0.10	F(1,54)= 2.69; p=0.11	F(1,173)= 2.77; p=0.10
Friends & Family Connections	No: 2.62 (0.07)/Yes: 2.72 (0.08)	No: 2.66 (0.19)/Yes: 2.72 (0.09)	No: 2.69 (0.17)/Yes: 2.73 (0.10)	No: 2.63 (0.06)/Yes: 2.75 (0.10)
	F(1,173)= 0.79; p=0.38	F(1,67)= 0.08; p=0.79	F(1,54)= 0.03; p=0.86	F(1,173)= 1.23; p=0.27
Tolerance of Diversity	No: 2.87 (0.07)/Yes: 2.98 (0.09)	No: 2.84 (0.19)/Yes: 3.01 (0.09)	No: 2.96 (0.17)/Yes: 3.02 (0.10)	No: 2.92 (0.07)/Yes: 2.90 (0.10)
	F(1,173)= 0.83; p=0.36	F(1,67)= 0.65; p=0.42	F(1,54)= 0.11; p=0.74	F(1,173)= 0.01; p=0.91
Value of Life	No: 2.83 (0.09)/Yes: 2.73 (0.11)	No: 2.92 (0.25)/Yes: 2.68 (0.12)	No: 2.64 (0.23)/Yes: 2.69 (0.14)	No: 2.74 (0.08)/Yes: 2.92 (0.12)
	F(1,173)= 0.58; p=0.45	F(1,67)= 0.77; p=0.38	F(1,54)= 0.04; p=0.85	F(1,173)= 1.43; p=0.23
Work Connections	No: 3.00 (0.30)/Yes: 3.00 (0.60)	No: 3.05 (0.72)/Yes: 3.19 (1.26)	No: 3.33 (---)/Yes: --- (---)	No: 2.72 (0.29)/Yes: 3.73 (0.50)
	F(1,15)= 0.000; p=1.00	F(1,1)= 0.01; p=0.94	-------	F(1,15)= 2.82; p=0.11

Table 8.14d Differences in treatment appropriateness according to illness perceptions – adjusted for disease severity (analyses of covariance - ANCOVA)

ANCOVA	**Over-treated** *(adjusted means and SD)*	**Appropriately Treated** *(adjusted means and SD)*	**Under-treated** *(adjusted means and SD)*
Identity	No: 3.49 (0.22)/Yes: 4.21 (0.31)	No: 3.60 (0.24)/Yes: 3.90 (0.25)	No: 3.94 (0.20)/Yes: 3.20 (0.34)
	F(1,173)= 3.40; *p*=0.07	F(1,173)= 0.74; *p*=0.39	F(1,173)= 3.65; *p*=0.06
Timeline Chronic	No: 3.76 (0.06)/Yes: 3.96 (0.09)	No: 3.76 (0.71)/Yes: 3.91 (0.60)	No: 3.88 (0.06)/Yes: 3.70 (0.10)
	F(1,173)= 3.16; *p*=0.08	F(1,173)= 2.42; *p*=0.12	F(1,173)= 2.50; *p*=0.12
Consequences	No: 2.80 (0.07)/Yes: 3.00 (0.09)	**No: 2.75 (0.70)/Yes: 3.00 (0.68)**	**No: 2.94 (0.06)/Yes: 2.70 (0.10)**
	F(1,173)= 2.91; *p*=0.09	**F(1,173)= 6.63; *p*=0.01**	**F(1,173)= 3.86; *p*=0.05**
Personal Control	No: 3.41 (0.07)/Yes: 3.53 (0.10)	No: 3.48 (0.08)/Yes: 3.42 (0.08)	No: 3.47 (0.06)/Yes: 3.39 (0.11)
	F(1,173)= 1.08; *p*=0.30	F(1,173)= 0.27; *p*=0.61	F(1,173)= 3.40; *p*=0.07
Treatment Control	No: 3.20 (0.05)/Yes: 3.29 (0.07)	No: 3.23 (0.05)/Yes: 3.23 (0.05)	No: 3.27 (0.04)/Yes: 3.12 (0.07)
	F(1,173)= 1.26; *p*=0.26	F(1,173)= 0.001; *p*=0.97	F(1,173)= 3.64; *p*=0.06
Illness Coherence	No: 3.64 (0.07)/Yes: 3.70 (0.09)	No: 3.61 (0.07)/Yes: 3.72 (0.07)	No: 3.71 (0.06)/Yes: 3.53 (0.10)
	F(1,173)= 0.23; *p*=0.63	F(1,173)= 1.27; *p*=0.26	F(1,173)= 2.50; *p*=0.12
Timeline Cyclical	No: 2.84 (0.08)/Yes: 2.94 (0.11)	No: 2.88 (0.08)/Yes: 2.87 (0.09)	No: 2.91 (0.07)/Yes: 2.77 (0.12)
	F(1,173)= 0.62; *p*=0.43	F(1,173)= 0.005; *p*=0.94	F(1,173)= 1.12; *p*=0.29
Emotional Representations	No: 2.49 (0.07)/Yes: 2.72 (0.10)	No: 2.54 (0.08)/Yes: 2.59 (0.08)	No: 2.62 (0.06)/Yes: 2.42 (0.11)
	F(1,173)= 3.60; *p*=0.06	F(1,173)= 0.20; *p*=0.66	F(1,173)= 2.55; *p*=0.11

Table 8.14e Differences in treatment appropriateness according to self-efficacy and social capital – adjusted for disease severity (analyses of covariance - ANCOVA)

ANCOVA	**Over-treated** *(adjusted means and SD)*	**Appropriately Treated** *(adjusted means and SD)*	**Under-treated** *(adjusted means and SD)*
Self-efficacy	No: 3.30 (0.06)/Yes: 3.26 (0.08)	No: 3.26 (0.06)/Yes: 3.32 (0.07)	No: 3.31 (0.05)/Yes: 3.23 (0.09)
	F(1,173)= 0.16; *p*=0.69	F(1,173)= 0.51; *p*=0.48	F(1,173)= 0.53; *p*=0.47
Social Capital			
Participation in Local Community	No: 1.38 (0.06)/Yes: 1.47 (0.09)	No: 1.47 (0.07)/Yes: 1.34 (0.07)	No: 1.41 (0.06)/Yes: 1.42 (0.10)
	F(1,173)= 0.54; *p*=0.46	F(1,173)= 1.71; *p*=0.20	F(1,173)= 0.03; *p*=0.87
Social Agency/Social Proactivity	No: 2.94 (0.06)/Yes: 2.97 (0.08)	No: 2.92 (0.06)/Yes: 2.98 (0.07)	No: 2.98 (0.05)/Yes: 2.87 (0.09)
	F(1,173)= 0.07; *p*=0.79	F(1,173)= 0.44; *p*=0.51	F(1,173)= 1.06; *p*=0.31
Feelings of Trust & Safety	No: 2.40 (0.07)/Yes: 2.50 (0.10)	No: 2.49 (0.08)/Yes: 2.38 (0.08)	No: 2.44 (0.06)/Yes: 2.43 (0.11)
	F(1,173)= 0.78; *p*=0.38	F(1,173)= 0.92; *p*=0.34	F(1,173)= 0.007; *p*=0.93
Neighbourhood Connections	No: 2.63 (0.08)/Yes: 2.69 (0.11)	No: 2.65 (0.08)/Yes: 2.65 (0.09)	No: 2.69 (0.07)/Yes: 2.54 (0.11)
	F(1,173)= 0.24; *p*=0.63	F(1,173)= 0.001; *p*=0.96	F(1,173)= 1.33; *p*=0.25
Friends & Family Connections	**No: 2.55 (0.07)/Yes: 2.86 (0.10)**	No: 2.62 (0.07)/Yes: 2.71 (0.07)	No: 2.72 (0.06)/Yes: 2.50 (0.10)
	F(1,173)= 7.31; *p*=0.008	F(1,173)= 0.71; *p*=0.40	F(1,173)= 3.59; *p*=0.06
Tolerance of Diversity	No: 2.83 (0.07)/Yes: 3.06 (0.10)	No: 2.92 (0.08)/Yes: 2.91 (0.08)	No: 2.95 (0.06)/Yes: 2.80 (0.11)
	F(1,173)= 3.48; *p*=0.06	F(1,173)= 0.009; *p*=0.92	F(1,173)= 1.45; *p*=0.23
Value of Life	No: 2.73 (0.09)/Yes: 2.90 (0.12)	No: 2.84 (0.09)/Yes: 2.74 (0.10)	No: 2.84 (0.08)/Yes: 2.66 (0.13)
	F(1,173)= 1.25; *p*=0.27	F(1,173)= 0.63; *p*=0.43	F(1,173)= 1.54; *p*=0.22
Work Connections	No: 2.85 (0.36)/Yes: 3.24 (0.46)	No: 2.99 (0.32)/Yes: 3.03 (0.46)	**No: 3.22 (0.25)/Yes: 1.87 (0.58)**
	F(1,15)= 0.38; *p*=0.55	F(1,15)= 0.006; *p*=0.94	**F(1,15)= 4.55; *p*=0.05**

8.6 Associations between the psychosocial variables and quality of life

8.6.1 Illness perceptions and QoL

QoL was significantly associated with illness perceptions regardless of disease severity (see Table 8.15).

Worse dyspnoea was significantly correlated to stronger identity, timeline, consequences, timeline cyclical, emotional representations and weaker personal control and treatment control.

Greater fatigue showed significant correlations with stronger identity, consequences, timeline cyclical, emotional representations, weaker personal control and illness coherence.

Poorer emotional function was significantly correlated to stronger identity, consequences, timeline cyclical, emotional representations and weaker treatment control and illness coherence.

Greater mastery showed significant correlations with weaker identity, consequences, timeline cyclical, emotional representations, stronger personal control, treatment control and illness coherence.

Higher risk of anxiety was significantly correlated to stronger identity, consequences, timeline cyclical, emotional representations and weaker illness coherence.

Higher risk of depression was associated with stronger identity, consequences, emotional representations, timeline cyclical and weaker personal and treatment control as well as weaker illness coherence.

The remaining dimensions of illness perceptions were not significantly associated with QoL. Unadjusted analyses are presented in Appendix F9.

Table 8.15 Correlations between illness perceptions and QoL adjusted for disease severity (Pearson's Correlations - partial)

	Dyspnoea	Fatigue	Emotional Function	Mastery	Anxiety	Depression
Identity	**r= -0.57 (p< 0.001)**	**r= -0.36 (p< 0.001)**	**r= -0.38 (p< 0.001)**	**r= -0.47 (p< 0.001)**	**r= 0.31 (p< 0.001)**	**r= 0.33 (p< 0.001)**
Timeline Chronic	**r= -0.20 (p= 0.007)**	r= -0.04 (p= 0.62)	r= -0.02 (p= 0.79)	r= -0.05 (p= 0.54)	r= 0.02 (p= 0.76)	r= 0.12 (p= 0.12)
Consequences	**r= -0.65 (p< 0.001)**	**r= -0.50 (p< 0.001)**	**r= -0.42 (p< 0.001)**	**r= -0.49 (p< 0.001)**	**r= 0.36 (p< 0.001)**	**r= 0.40 (p< 0.001)**
Personal Control	**r= 0.17 (p= 0.02)**	**r= 0.23 (p= 0.003)**	r= 0.13 (p= 0.09)	**r= 0.26 (p= 0.006)**	r= -0.11 (p= 0.17)	**r= -0.25 (p= 0.001)**
Treatment Control	**r= 0.20 (p= 0.01)**	r= 0.14 (p= 0.07)	**r= 0.15 (p= 0.05)**	**r= 0.16 (p= 0.04)**	r= -0.06 (p= 0.47)	**r= -0.32 (p< 0.001)**
Illness Coherence	r= 0.12 (p= 0.12)	**r= 0.18 (p= 0.02)**	**r= 0.18 (p= 0.02)**	**r= 0.22 (p= 0.003)**	**r= -0.26 (p= 0.001)**	**r= -0.16 (p= 0.03)**
Timeline Cyclical	**r= -0.24 (p= 0.001)**	**r= -0.31 (p< 0.001)**	**r= -0.22 (p= 0.003)**	**r= -0.26 (p= 0.001)**	**r= 0.25 (p= 0.001)**	**r= 0.14 (p= 0.06)**
Emotional Representations	**r= -0.40 (p< 0.001)**	**r= -0.38 (p< 0.001)**	**r= -0.49 (p< 0.001)**	**r= -0.54 (p< 0.001)**	**r= 0.52 (p< 0.001)**	**r= 0.34 (p< 0.001)**

8.6.2 Self-efficacy and QoL

QoL was significantly associated with self-efficacy (see Table 8.16 for adjusted analyses). Correlations were unaffected when adjusting for disease severity (see Appendix F10). Better QoL was correlated to higher self-efficacy. Lower fatigue, better emotional function, perceptions of higher mastery and lower risk of depression and anxiety were significantly correlated to stronger self-efficacy.

Table 8.16 Correlations between self-efficacy and QoL - adjusted for disease severity (Pearson's Correlations - partial)

QoL	Dyspnoea	Fatigue	Emotional Function	Mastery	Anxiety	Depression
Self-efficacy (GSE)	r= 0.11 (*p*= 0.13)	**r= 0.24 (*p*= 0.001)**	**r= 0.33 (p< 0.001)**	**r= 0.41 (p< 0.001)**	**r= -0.28 (p< 0.001)**	**r= -0.41 (p< 0.001)**

8.6.3 Social capital and QoL

QoL was significantly associated with certain elements of social capital (see Table 8.17). Within these, poorer QoL was significantly correlated to lower social capital.

Greater participation in local community was significantly correlated to greater dyspnoea and greater fatigue, worse emotional function and higher risk of anxiety and depression.

Greater social proactivity, more family and friend connections, stronger value of life beliefs and more work connections were significantly associated with lower risk of depression.

The correlations involving work connections must be treated with caution due to the small number of participants still in employment (10.8%). The remaining measures of social capital were not significantly correlated to QoL. Unadjusted analyses differed slightly and are presented in Appendix F11.

Table 8.17 Correlations between social capital and QoL – adjusted for disease severity (Pearson's Correlations - partial)

	Dyspnoea	Fatigue	Emotional Function	Mastery	Anxiety	Depression
Participation Local Community	**r= -0.55 (*p*= 0.02)**	**r= -0.62 (*p*= 0.009)**	**r= -0.59 (*p*= 0.01)**	r= -0.04 (*p*= 0.89)	**r= 0.65 (*p*= 0.005)**	**r= 0.54 (*p*= 0.03)**
Social Agency/Proactivity	r= -0.04 (*p*= 0.90)	r= -0.03 (*p*= 0.92)	r= -0.14 (*p*= 0.60)	r= -0.07 (*p*= 0.80)	r= 0.21 (*p*= 0.42)	**r= -0.23 (*p*= 0.38)**
Trust and Safety	r= -0.20 (*p*= 0.43)	r= 0.02 (*p*= 0.94)	r= 0.18 (*p*= 0.49)	r= 0.15 (*p*= 0.56)	r= -0.17 (*p*= 0.51)	r= 0.13 (*p*= 0.62)
Neighbourhood Connections	r= -0.21 (*p*= 0.43)	r= -0.22 (*p*= 0.39)	r= -0.10 (*p*= 0.70)	r= -0.14 (*p*= 0.59)	r= 0.04 (*p*= 0.88)	r= -0.15 (*p*= 0.57)
Family & Friends Connections	r= 0.22 (*p*= 0.39)	r= 0.28 (*p*= 0.28)	r= 0.27 (*p*= 0.29)	r= 0.10 (*p*= 0.69)	r= -0.12 (*p*= 0.65)	**r= -0.57 (*p*= 0.02)**
Tolerance of Diversity	r= -0.20 (*p*= 0.45)	r= -0.04 (*p*= 0.88)	r= 0.04 (*p*= 0.89)	r= -0.11 (*p*= 0.69)	r= 0.10 (*p*= 0.69)	r= -0.19 (*p*= 0.47)
Value of Life	r= -0.16 (*p*= 0.54)	r= 0.06 (*p*= 0.81)	r= 0.18 (*p*= 0.49)	r= -0.17 (*p*= 0.57)	r= -0.06 (*p*= 0.82)	**r= -0.49 (*p*= 0.05)**
Work Connections	r= -0.14 (*p*= 0.61)	r= 0.03 (*p*= 0.92)	r= 0.05 (*p*= 0.86)	r= -0.23 (*p*= 0.38)	r= -0.23 (*p*= 0.39)	**r= -0.49 (*p*= 0.05)**

8.6.4 Summary

Lower SES was associated with better HCA in patients with COPD. This finding refuted the hypothesis with respect to this element of the research. Higher SES was associated with better QoL. The hypothesis was supported with respect to this element of the research.

Other variables influencing these relationships were as follows:

- Illness perceptions were significantly associated with QoL. Participants who had more negative thoughts and beliefs about their COPD (e.g. attributing more symptoms to their COPD, perceiving greater impact of their COPD on their everyday life and less control over the illness) were more likely to report poorer QoL (e.g. worse dyspnoea, greater fatigue) regardless of disease severity.
- COPD patients' self-efficacy was found to be significantly correlated to quality of life. Participants who had more positive beliefs about their capabilities were more likely to report better QoL (e.g. lower fatigue, lower risk of anxiety) regardless of disease severity.
- Certain elements of social capital were significantly correlated to QoL Participants with greater participation in local community, greater social proactivity more networks and stronger feelings of value of life were more likely to report better quality of life. More active participation in the local community was associated with worse QoL in terms of anxiety and depression.
- All three proposed psychosocial variables (illness perceptions, self-efficacy and social capital) were found to be significantly related to QoL in patients with COPD. The following section introduced multiple mediation analysis which was conducted in order to explore the role of these variables as mediators in the relationship between SES and HCA and QoL.

8.7 The role of psychosocial variables as proposed mediators in the relationship between SES and HCA and SES and QoL

8.7.1 Introduction

The aim of the final section of the analyses aimed to determine whether illness perceptions, self-efficacy and social capital mediated the relationship between SES and HCA or QoL in patients with COPD. For calculation of direct and indirect effects with the use of multiple mediators, Preacher and Hayes' (2012) Process bootstrapping method was used. Analyses and bootstrap estimates conducted used bootstrap samples of 5,000. The size of indirect effect estimates is completely dependent on the scales used for each variable in the analysis and should not be mistaken for effect size. Mediation analyses were conducted only where univariate and multivariate statistical analyses had previously indicated the existence of statistically significant relationships between SES and HCA and QoL. All analyses were adjusted for disease severity and are presented in Tables 8.18-8.51 and Figures 8.1-8.34. Unadjusted analyses are presented in Appendix F10-F12.

8.7.2 Was the relationship between SES and HCA mediated by psychosocial variables?

The significant relationships between SES (in terms of income level and educational attainment) and HCA (smoking cessation referrals and regular spirometry) found in previous analyses (see Section 8.4) were mediated by social capital and illness perceptions respectively but not by self-efficacy. The relationship between income level and smoking cessation referral was mediated by value of life (social capital dimension) while the relationship between educational level and regular spirometry was mediated by treatment control (illness perception dimension). No other relationships were mediated by any of the dimensions of illness perceptions and social capital or by self-efficacy. Analyses were adjusted for disease severity and are presented in Tables 8.18-8.29 and Figures 8.1-8.12. Unadjusted analyses are presented in Appendix F10.

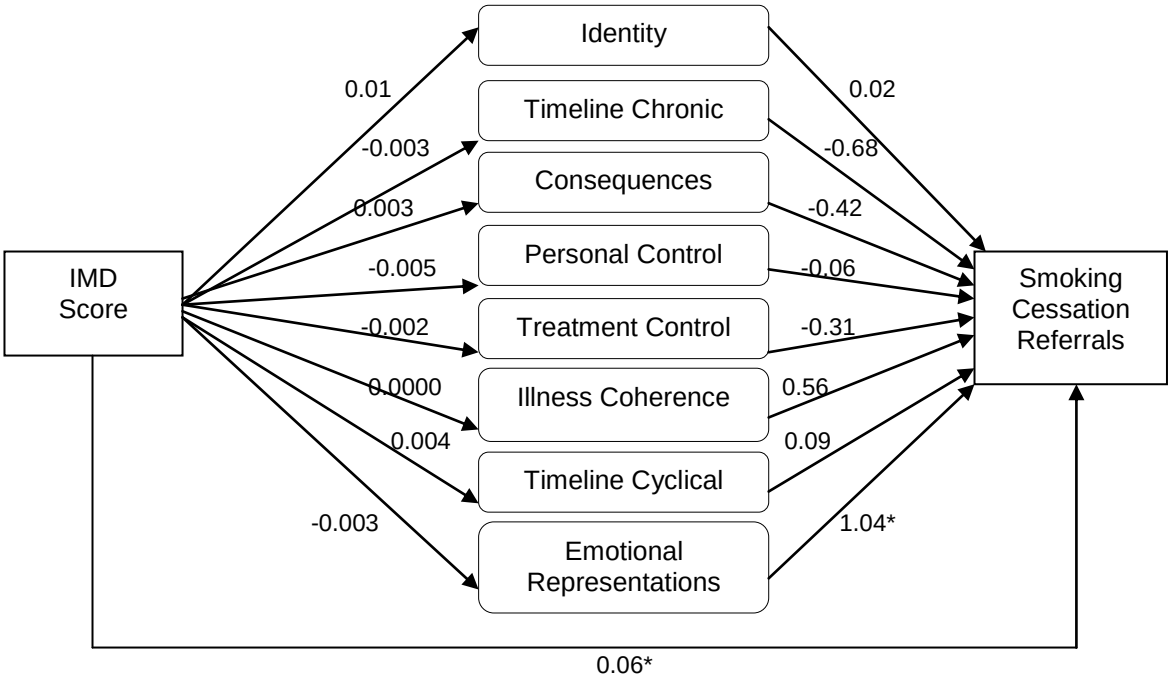
a. Was the relationship between SES and HCA mediated by illness perceptions?

Illness perceptions mediated one of the significant relationships between SES and HCA when adjusting for disease severity. The relationship between educational level and regular spirometry was mediated by treatment control. The remaining statistically significant relationships between SES and HCA were not mediated by any of the dimensions of illness perceptions and social capital or by self-efficacy (see Tables 8.18-8.21 and Figures 8.1-8.4). Unadjusted analyses are presented in Appendix F10.

Table 8.18 Direct, total and specific indirect effects of IMD scores and illness perceptions on HCA (smoking cessation referral) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.06	3.06	0.002	0.0203	0.0929
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.0008			-0.0183	0.0184
Specific indirect effects					
Identity	0.0002			-0.0052	0.0074
Timeline Chronic	0.0017			-0.0108	0.0144
Consequences	-0.0013			-0.0115	0.0059
Personal Control	0.0003			-0.0047	0.0060
Treatment Control	0.0006			-0.0071	0.0063
Illness Coherence	0.0000			-0.0063	0.0072
Timeline Cyclical	0.0004			-0.0046	0.0063
Emotional Representations	-0.0027			-0.0194	0.0116

Figure 8.1 Multiple mediation analysis examining the relationship between IMD score and HCA (smoking cessation referrals) mediated by illness perceptions in COPD adjusted for disease severity

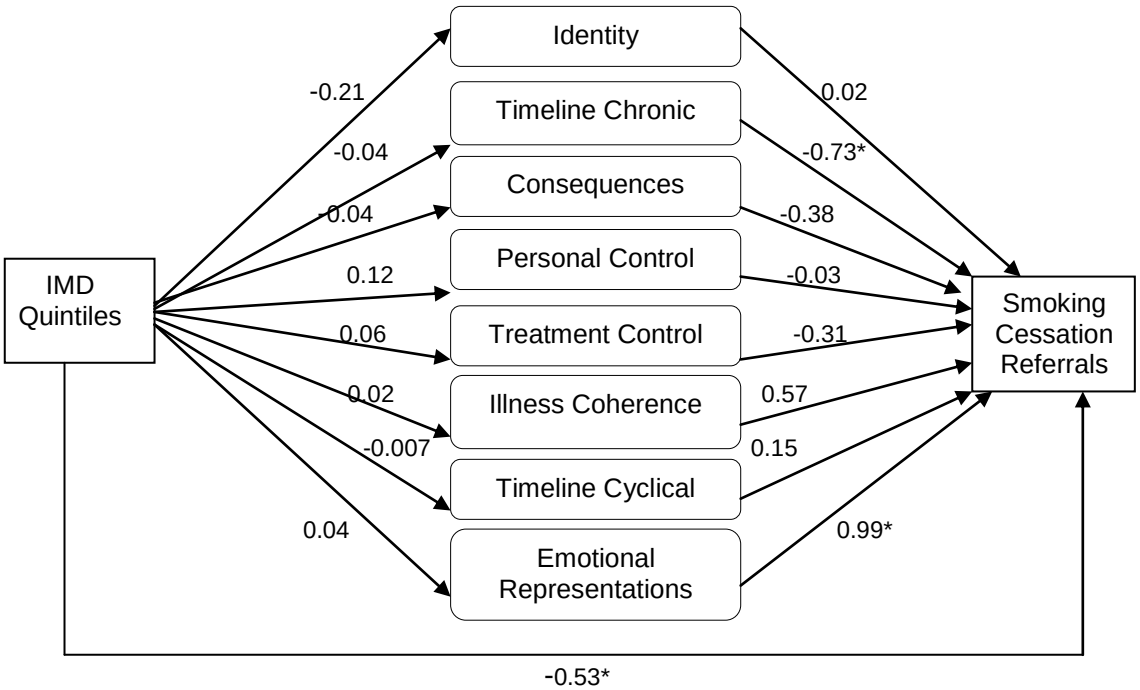


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.19 Direct, total and specific indirect effects of IMD quintiles and illness perceptions on HCA (smoking cessation referral) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.55	-2.41	0.02	-0.9935	-0.1029
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.07			-0.1810	0.3525
Specific indirect effects					
Identity	-0.004			-0.1146	0.0590
Timeline Chronic	0.03			-0.0766	0.2596
Consequences	0.02			-0.0362	0.1876
Personal Control	-0.004			-0.1108	0.0862
Treatment Control	-0.02			-0.1955	0.0319
Illness Coherence	0.01			-0.0721	0.1091
Timeline Cyclical	-0.001			-0.0847	0.0474
Emotional Representations	0.04			-0.1048	0.2838

Figure 8.2 Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by illness perceptions in COPD adjusted for disease severity

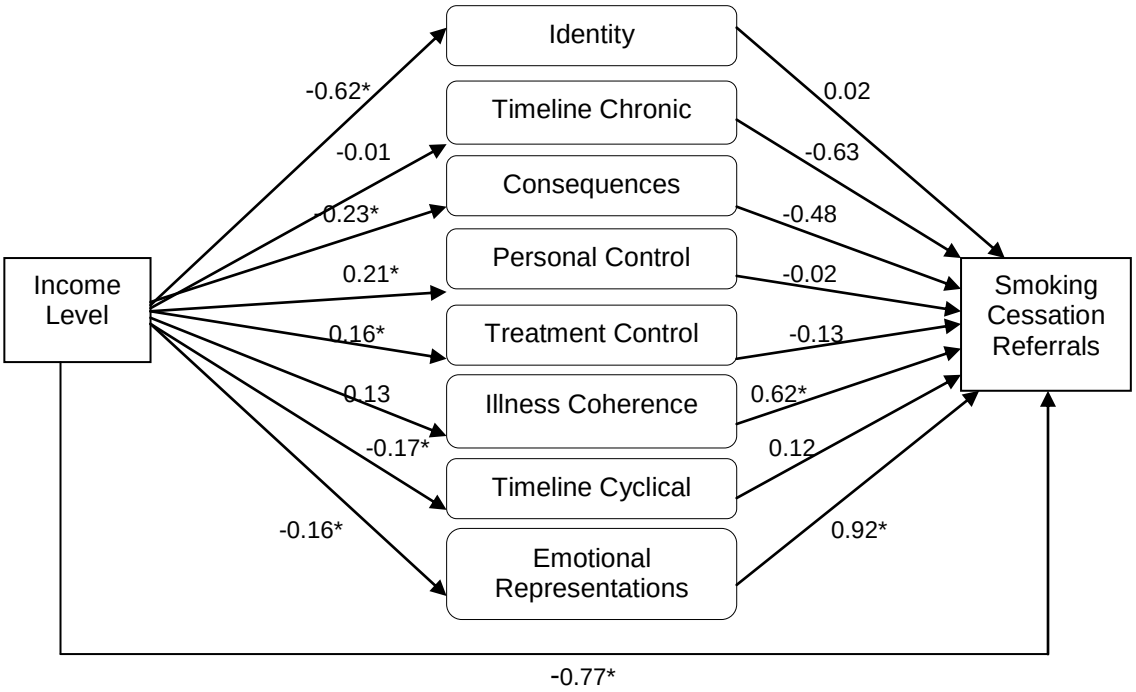


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.20 Direct, total and indirect effects of income level and illness perceptions on HCA (smoking cessation referral) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.77	-2.90	0.004	-0.5107	-0.0395
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.007			-0.3076	0.3322
Specific indirect effects					
Identity	-0.01			-0.1968	0.1387
Timeline Chronic	0.008			-0.1118	0.1877
Consequences	0.11			-0.1146	0.3896
Personal Control	-0.004			-0.1807	0.1442
Treatment Control	-0.02			-0.2359	0.1360
Illness Coherence	0.08			-0.0021	0.2262
Timeline Cyclical	-0.02			-0.1845	0.0764
Emotional Representations	-0.15			-0.4974	0.0062

Figure 8.3 Multiple mediation analysis examining the relationship between income and HCA (smoking cessation referrals) mediated by illness perceptions in COPD adjusted for disease severity

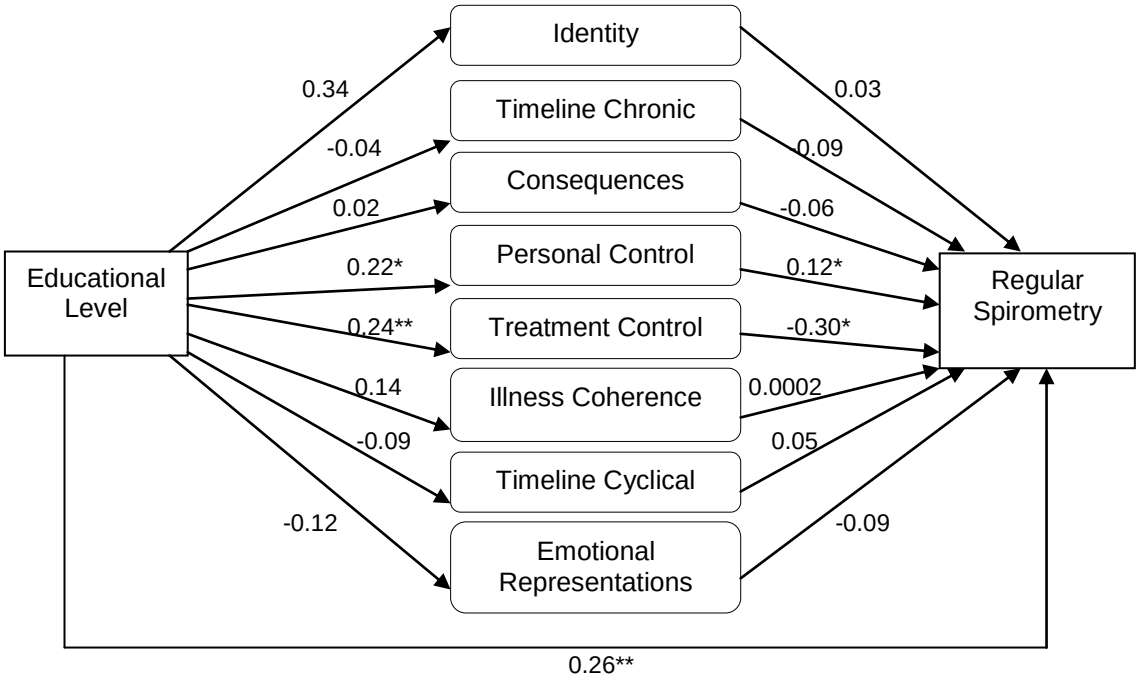


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.21 Direct, total and specific indirect effects of educational level and illness perceptions on HCA (regular spirometry) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.26	3.33	0.001	0.1062	0.4164
Indirect effects	Point estimate			Lower	Upper
Total	-0.03			-0.0909	0.0430
Specific indirect effects					
Identity	0.01			-0.0107	0.0544
Timeline Chronic	0.003			-0.0216	0.0294
Consequences	-0.0011			-0.0256	0.0208
Personal Control	0.03			-0.0036	0.0714
Treatment Control	-0.0730			-0.1418	-0.0229
Illness Coherence	0.0000			-0.0196	0.0230
Timeline Cyclical	-0.0041			-0.0266	0.0124
Emotional Representations	0.0104			-0.0100	0.0474

Figure 8.4 Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by illness perceptions in COPD adjusted for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

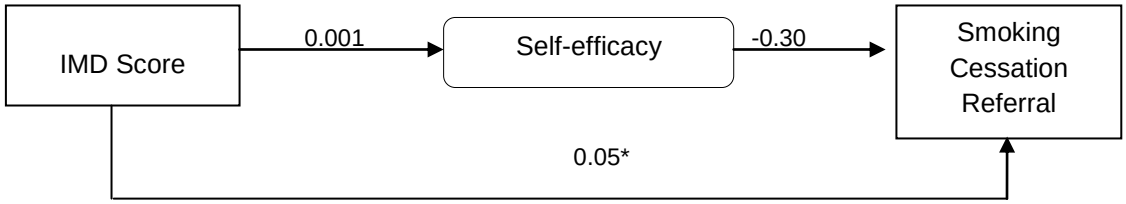
a. Was the relationship between SES and HCA mediated by self-efficacy?

Self-efficacy did not mediate any of the significant relationships between SES and HCA when adjusting for disease severity (see Tables 8.22-8.25 and Figures 8.5-8.8). Unadjusted analyses are presented in Appendix F10.

Table 8.22 Direct, total and specific indirect effects of IMD scores and self-efficacy on HCA (smoking cessation referrals) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.05	2.91	0.004	0.0159	0.0816
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	-0.0003			-0.0078	0.0024

Figure 8.5 Multiple mediation analysis examining the relationship between IMD scores and HCA (smoking cessation referrals) mediated by self-efficacy in COPD adjusting for disease severity

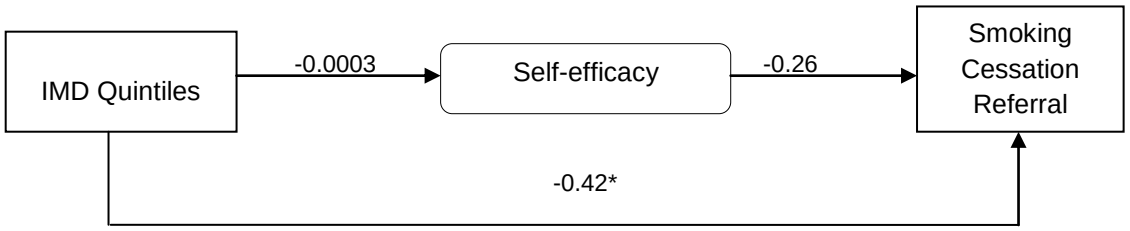


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.23 Direct, total and specific indirect effects of IMD quintiles and self-efficacy on HCA (smoking cessation referrals) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.42	-2.04	0.04	-0.8245	-0.0156
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.0001			-0.0545	0.0577

Figure 8.6 Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by self-efficacy in COPD adjusted for disease severity

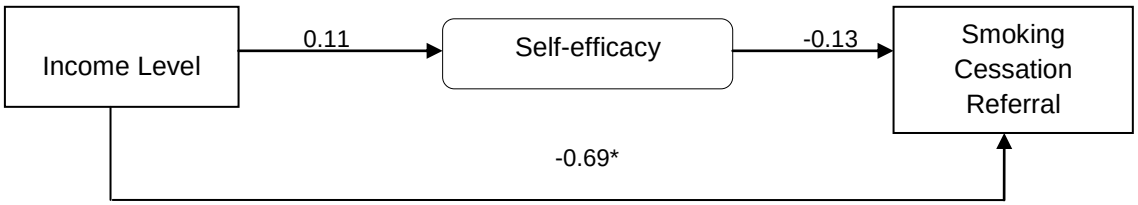


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.24 Total and specific indirect effects of income level and self-efficacy on HCA (smoking cessation referrals) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.69	-2.87	0.004	-1.1641	-0.2195
Indirect effects	**Point estimate**			**Lower**	**Upper**
Specific indirect effect					
Self-efficacy	-0.01			-0.1399	0.0411

Figure 8.7 Multiple mediation analysis examining the relationship between income level and HCA (smoking cessation referrals) mediated by self-efficacy in COPD adjusting for disease severity

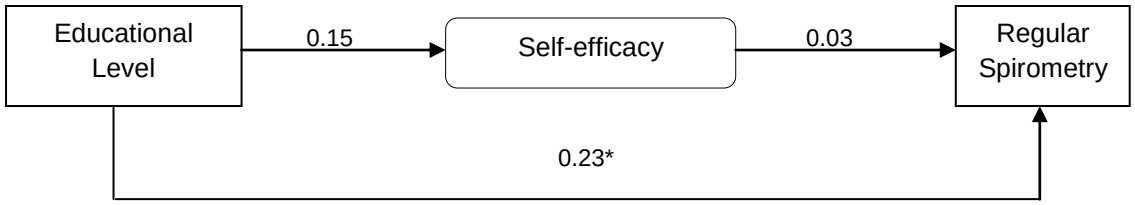


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.25 Direct, total and specific indirect effects of educational level and self-efficacy on HCA (regular spirometry) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.23	3.03	0.003	0.0807	0.3812
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.004			-0.0105	0.0353

Figure 8.8 Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by self-efficacy in COPD adjusting for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

c. Was the relationship between SES and HCA mediated by social capital?

Results indicated that social capital mediated:

- The relationship between income level and smoking cessation referrals. Participants who had higher income were more likely to have stronger perceptions of value of life which were associated with higher likelihood of smoking cessation referrals. No other social capital dimension mediated this relationship. Details on the coefficients between income level, social capital and smoking cessation referrals are presented in Table 8.28 and Figure 8.11.

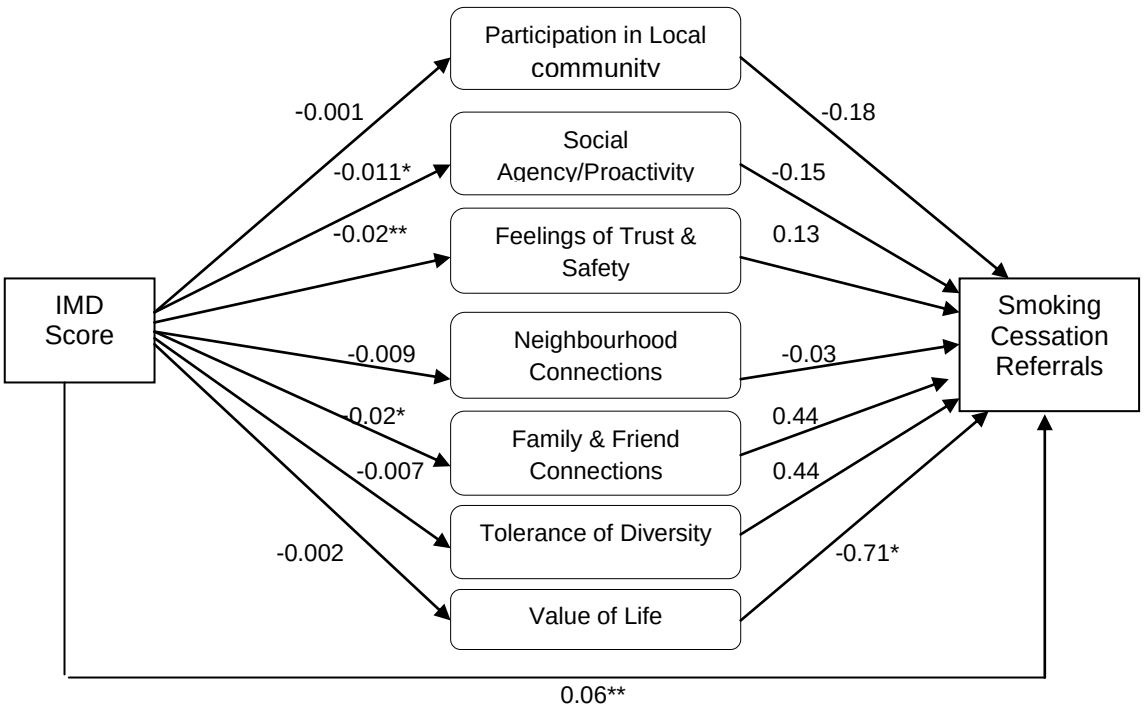
Social capital did not mediate any of the other significant relationships between SES and HCA when adjusting for disease severity (see Tables 8.26-8.27 and 8.29 8.26-8.29 and Figures 8.9-8.10 and 8.12). Unadjusted analyses are presented in Appendix F10.

Table 8.26 Direct, total and specific indirect effects of IMD scores and social capital on HCA (smoking cessation referral) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.06	3.22	0.001	0.0246	0.1009

Indirect effects	Point estimate	Lower	Upper
Total	-0.009	-0.0292	0.0103
Specific indirect effects			
Participation in local community	0.0002	-0.0019	0.0069
Social Agency/Proactivity	0.002	-0.0088	0.0145
Feelings of trust & safety	-0.003	-0.0062	0.0091
Neighbourhood connections	-0.007	-0.0253	0.0037
Family & friends connections	-0.005	-0.0218	0.0047
Tolerance of diversity	-0.003	-0.0143	0.0016
Value of life	0.002	-0.0086	0.0144

Figure 8.9 Multiple mediation analysis examining the relationship between IMD score and HCA (smoking cessation referrals) mediated by social capital in COPD adjusted for disease severity

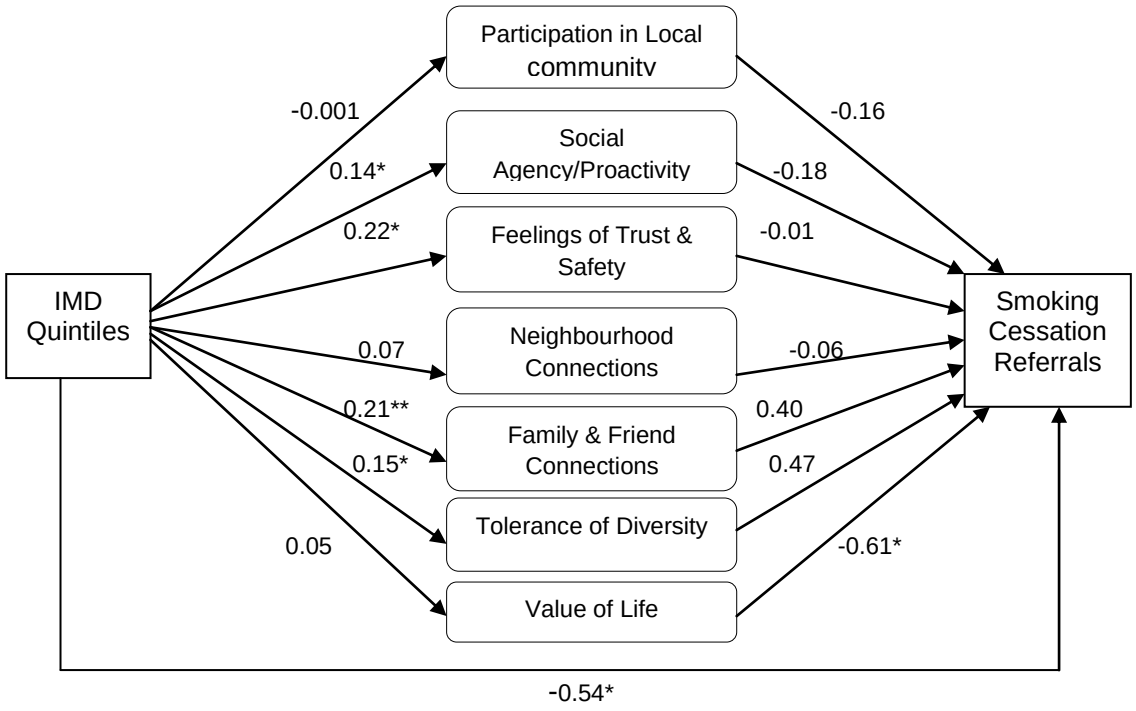


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.27 Direct, total and specific indirect effects of IMD quintiles and social capital on HCA (smoking cessation referral) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.54	-2.32	0.02	-0.9890	-0.0837
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.09			-0.1484	0.3429
Specific indirect effects					
Participation in local community	0.0002			-0.0617	0.0557
Social Agency/Proactivity	-0.03			-0.2159	0.0914
Feelings of trust & safety	-0.003			-0.1490	0.1472
Neighbourhood connections	-0.004			-0.1128	0.0410
Family & friends connections	0.08			-0.0632	0.3175
Tolerance of diversity	0.07			-0.0171	0.2513
Value of life	-0.03			-0.1926	0.0639

Figure 8.10 Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by social capital in COPD adjusted for disease severity

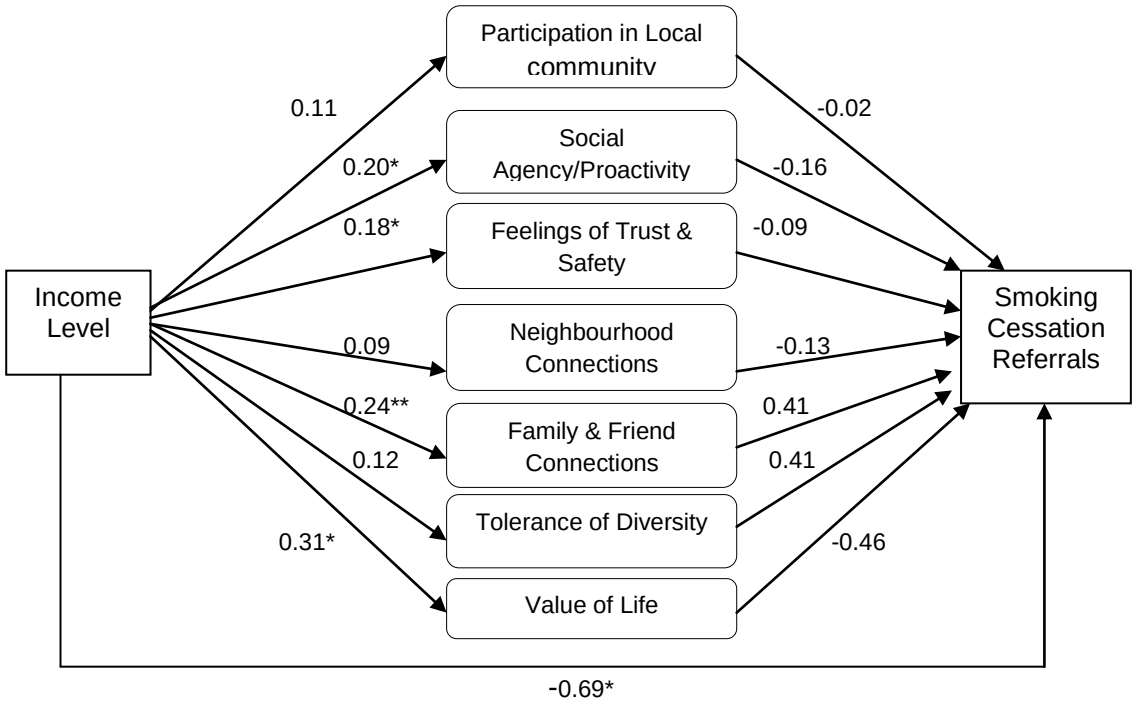


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.28 Direct, total and specific indirect effects of income level and social capital on HCA (smoking cessation referral) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.69	-2.62	0.009	-1.2011	-0.1735
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.06			-0.3525	0.2651
Specific indirect effects					
Participation in local community	-0.002			-0.1171	0.0836
Social Agency/Proactivity	-0.03			-0.2657	0.1504
Feelings of trust & safety	-0.02			-0.1864	0.0903
Neighbourhood connections	-0.01			-0.1713	0.0368
Family & friends connections	-0.10			-0.0700	0.3506
Tolerance of diversity	-0.05			-0.0169	0.2092
Value of life	-0.14			-0.3997	-0.0119

Figure 8.11 Multiple mediation analysis examining the relationship between income level and HCA (smoking cessation referrals) mediated by social capital in COPD adjusted for disease severity



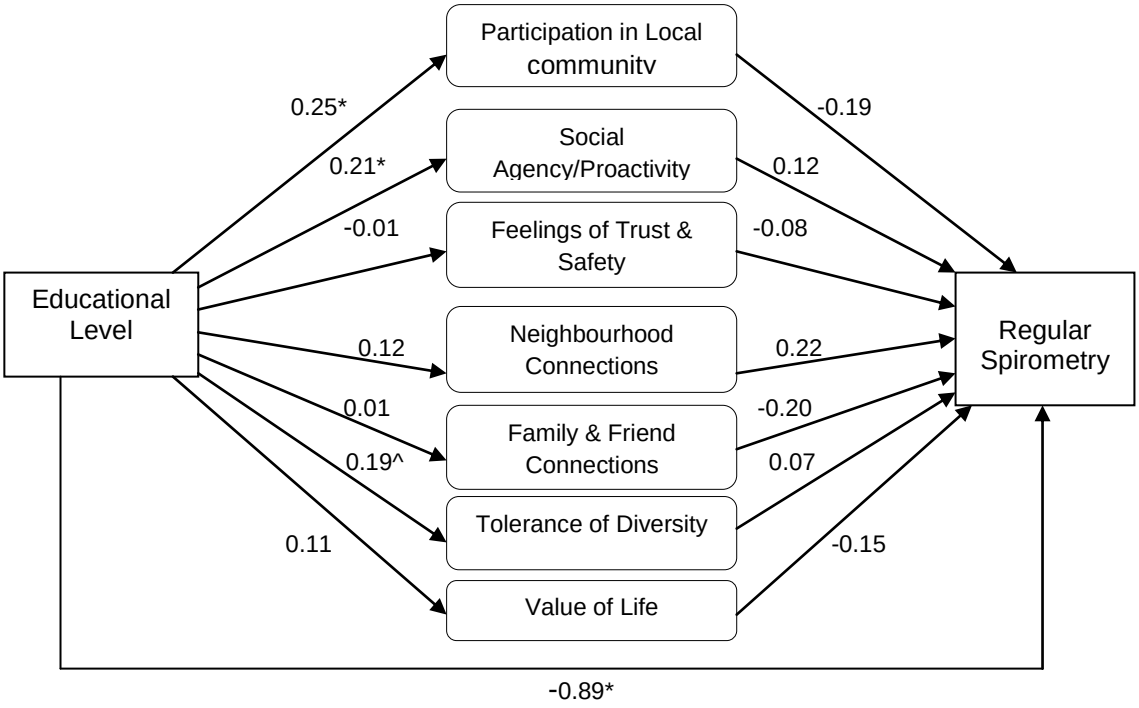
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.29 Direct, total and specific indirect effects of educational level and social capital on HCA (regular spirometry) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.89	-2.68	0.007	-1.5376	-0.2393

Indirect effects	Point estimate	Lower	Upper
Total	-0.0009	-0.2497	0.2933
Specific indirect effects			
Participation in local community	-0.05	-0.2797	0.0690
Social Agency/Proactivity	0.03	-0.1089	0.2651
Feelings of trust & safety	0.001	-0.0574	0.0835
Neighbourhood connections	0.03	-0.0302	0.2158
Family & friends connections	-0.003	-0.1225	0.0624
Tolerance of diversity	0.01	-0.0838	0.1586
Value of life	-0.02	-0.1716	0.0279

Figure 8.12 Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by social capital in COPD adjusted for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

8.7.3 Was the relationship between SES and QoL mediated by psychosocial variables?

The significant relationships between SES (in terms of income level) and QoL (dyspnoea, fatigue, emotional functioning, mastery, anxiety and depression) found in previous analyses (see Section 8.4) were mediated by certain dimension of the psychosocial variables examined as mediators. Results provided support for these variables mediating these associations relationships when adjusting for disease severity (see Tables 8.30-8.47 and Figures 8.13-8.30). Unadjusted analyses are presented in Appendix F11. Findings are discussed below.

a. Was the relationship between SES and QoL mediated by illness perceptions?

Results indicated that illness perceptions mediated:

- the relationship between income level and dyspnoea through identity and consequences. Patients who had higher weekly household income were more likely to report weaker identity perceptions and weaker consequence beliefs which were associated with lower levels of perceived dyspnoea. Income level and the mediators accounted for 6% of the variance in dyspnoea (R^2=0.06, F(2,173)=5.80; p=0.004). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and dyspnoea are presented in Table 8.30 and Figure 8.13;
- the relationship between income level and fatigue through consequences and personal control. Patients who had higher weekly household income were more likely to report weaker consequence beliefs and stronger perceptions of personal control which were associated with lower levels of perceived fatigue. Income level and the mediators accounted for 6% of the variance in fatigue (R^2=0.06, F(2,173)=5.40; p=0.005). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and fatigue are presented in Table 8.31 and Figure 8.14;
- the relationship between income level and emotional function through identity and emotional representations. Patients who had higher weekly household income were more likely to report weaker identity beliefs and weaker emotional representations which were associated with better emotional function. Income

level and the mediators accounted for 6% of the variance in emotional function (R^2=0.06, F(2,173)=5.37; p=0.006). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and emotional function are presented in Table 8.32 and Figure 8.15;

- the relationship between income level and mastery through identity, personal control and emotional representations. Patients who had higher weekly household income were more likely to report weaker identity perceptions, stronger perceptions of personal control and weaker emotional representations all of which were associated with stronger perceived mastery. Income level and the mediators accounted for 9% of the variance in mastery (R^2=0.09, F(2,173)=8.93; p=0.0002). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and mastery are presented in Table 8.33 and Figure 8.16;

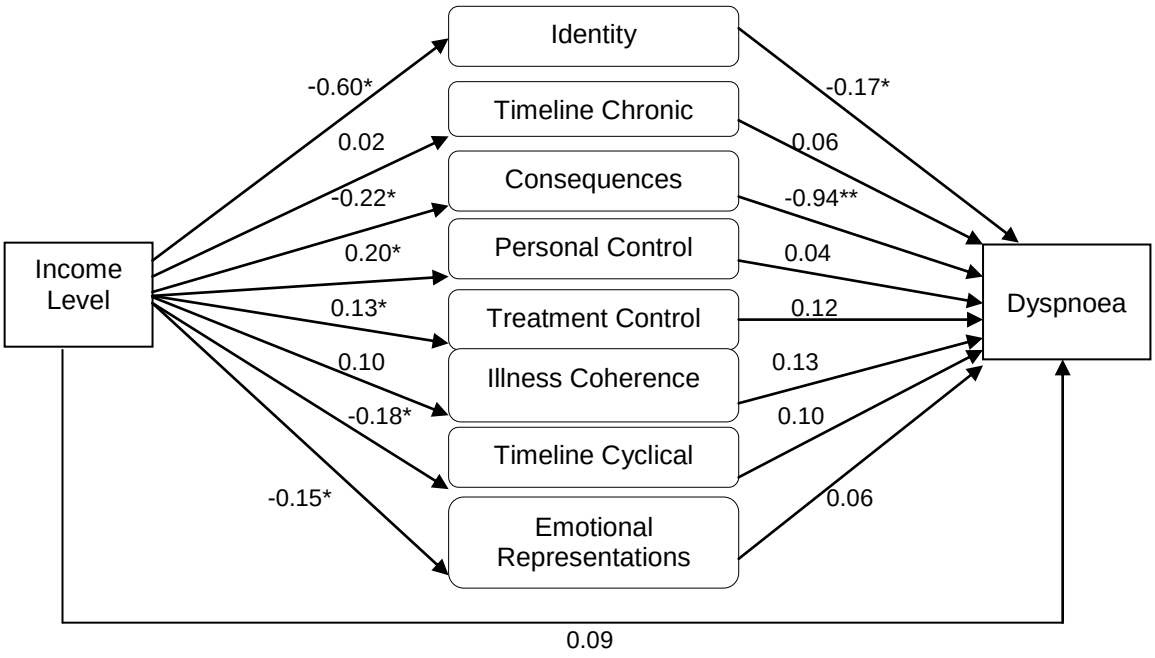
- the relationship between income level and anxiety through emotional representations. Patients who had higher weekly household income were more likely to report weaker emotional representations which were associated with lower risk of anxiety. Income level and the mediators accounted for 8% of the variance in anxiety (R^2=0.08, F(2,173)=7.04; p=0.002). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and anxiety are presented in Table 8.34 and Figure 8.17;

- the relationship between income level and depression through consequences and treatment control. Participants who had higher income were more likely to have stronger perceived consequences and treatment control beliefs which were associated with lower risk of depression. Income level and the mediators accounted for 8% of the variance in depression (R^2=0.08, F(2,173)=7.07; p=0.001). No other illness perception mediated this relationship. Details on the coefficients between income level, illness perceptions and depression are presented in Table 8.35 and Figure 8.18.

Table 8.30 Direct, total and specific indirect effects of income level and illness perceptions on QoL (dyspnoea) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.09	0.83	0.41	-0.1216	0.2962
Indirect effects	Point estimate			Lower	Upper
Total	0.32			0.1444	0.4993
Specific indirect effects					
Identity	0.10			0.0271	0.2292
Timeline Chronic	0.001			-0.0146	0.0396
Consequences	0.21			0.0807	0.3852
Personal Control	0.009			-0.0480	0.0714
Treatment Control	0.02			-0.0309	0.0861
Illness Coherence	0.01			-0.0063	0.0722
Timeline Cyclical	-0.02			-0.0757	0.0142
Emotional Representations	-0.01			-0.0784	0.0331

Figure 8.13 Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by illness perceptions in COPD adjusted for disease severity



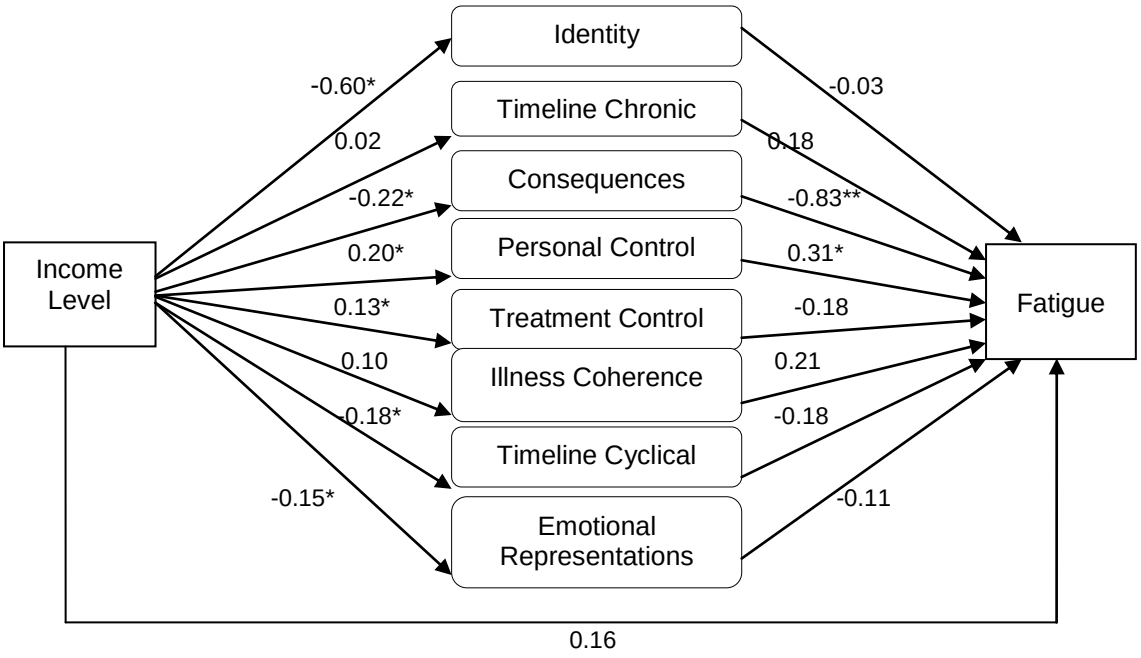
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.31 Direct, total and specific indirect effects of income level and illness perceptions on QoL (fatigue) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.16	1.22	0.22	-0.1016	0.4314

Indirect effects	Point estimate	Lower	Upper
Total	0.31	0.1620	0.4885
Specific indirect effects			
Identity	0.02	-0.0360	0.1049
Timeline Chronic	0.004	-0.0203	0.0640
Consequences	0.18	0.0681	0.3690
Personal Control	0.06	0.0093	0.1614
Treatment Control	-0.02	-0.1140	0.0297
Illness Coherence	0.02	-0.0042	0.0804
Timeline Cyclical	0.03	-0.0079	0.1244
Emotional Representations	0.02	-0.0246	0.0968

Figure 8.14 Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by illness perceptions in COPD adjusted for disease severity

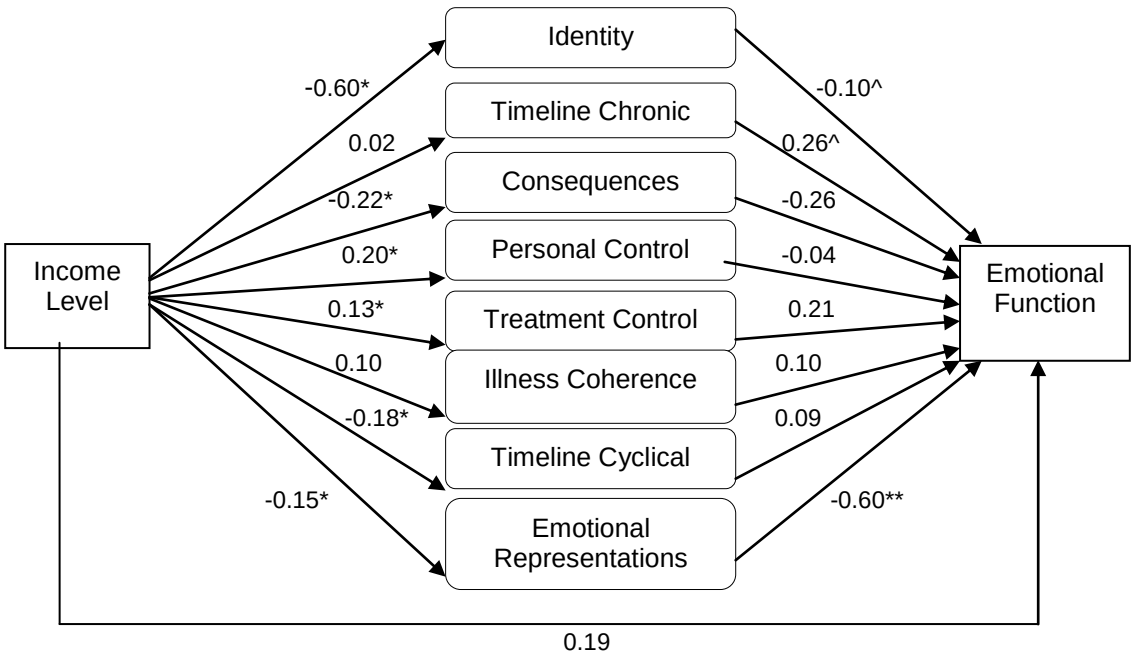


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.32 Direct, total and indirect effects of income level and illness perceptions on QoL (emotional function) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.19	1.63	0.11	-0.0413	0.4292
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.23			0.0860	0.3800
Specific indirect effects					
Identity	0.06			0.0027	0.1513
Timeline Chronic	0.006			-0.0306	0.0704
Consequences	0.06			-0.0112	0.1741
Personal Control	-0.009			-0.0726	0.0436
Treatment Control	0.03			-0.0202	0.1116
Illness Coherence	0.01			-0.0087	0.0625
Timeline Cyclical	-0.02			-0.0843	0.0221
Emotional Representations	0.09			0.0155	0.2103

Figure 8.15 Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by illness perceptions in COPD adjusted for disease severity



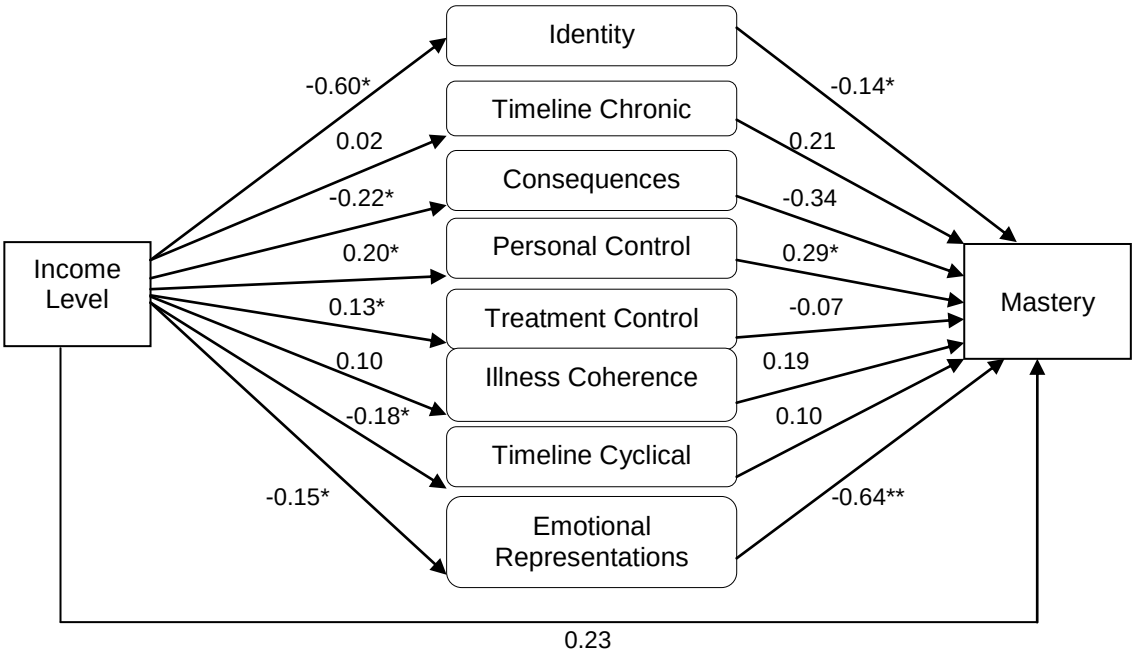
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.33 Direct, total and specific indirect effects of income level and illness perceptions on QoL (mastery) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.23	1.91	0.06	-0.0079	0.4766

Indirect effects	Point estimate	Lower	Upper
Total	0.32	0.1429	0.5052
Specific indirect effects			
Identity	0.09	0.0164	0.2067
Timeline Chronic	0.005	-0.0212	0.0769
Consequences	0.07	-0.0007	0.2047
Personal Control	0.06	0.0057	0.1558
Treatment Control	-0.009	-0.0796	0.0484
Illness Coherence	0.02	-0.0029	0.0874
Timeline Cyclical	-0.02	-0.0882	0.0231
Emotional Representations	0.10	0.0155	0.2452

Figure 8.16 Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by illness perceptions in COPD adjusted for disease severity

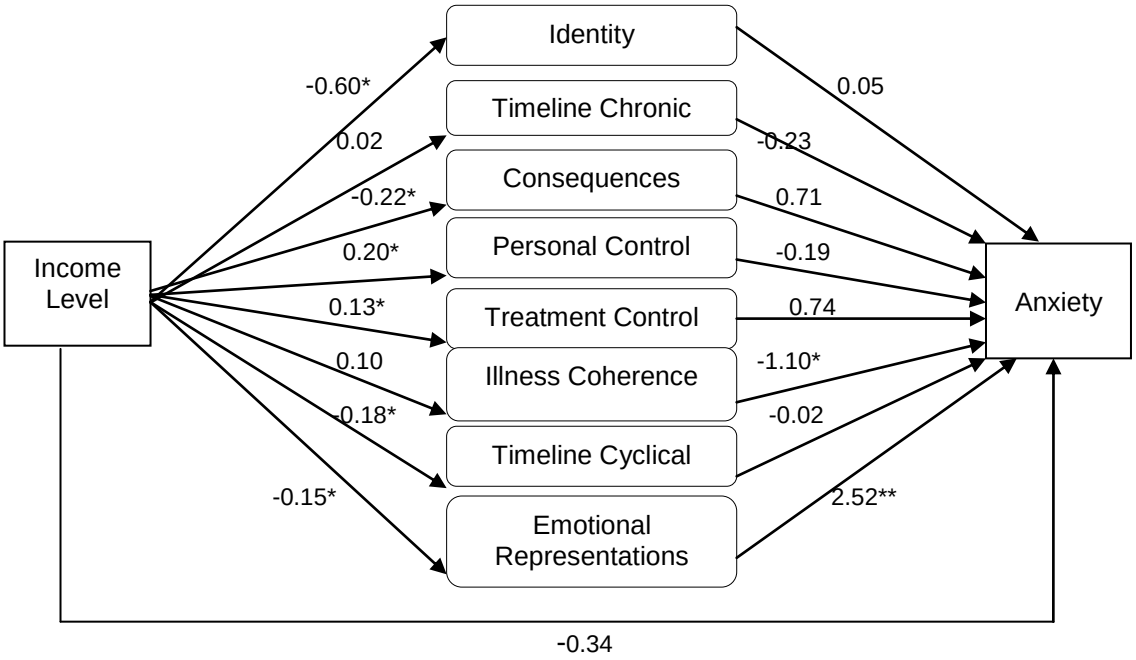


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.34 Direct, total and specific indirect effects of income level and illness perceptions on QoL (anxiety) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.34	-0.83	0.41	-1.1582	0.4709
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.62			-1.1749	-0.0862
Specific indirect effects					
Identity	-0.03			-0.2468	0.1773
Timeline Chronic	-0.006			-0.1821	0.0686
Consequences	-0.16			-0.5145	0.0661
Personal Control	-0.04			-0.2960	0.1466
Treatment Control	0.10			-0.0612	0.3689
Illness Coherence	-0.11			-0.3668	0.0025
Timeline Cyclical	0.004			-0.1742	0.1824
Emotional Representations	-0.39			-0.8922	-0.0593

Figure 8.17 Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by illness perceptions in COPD adjusted for disease severity

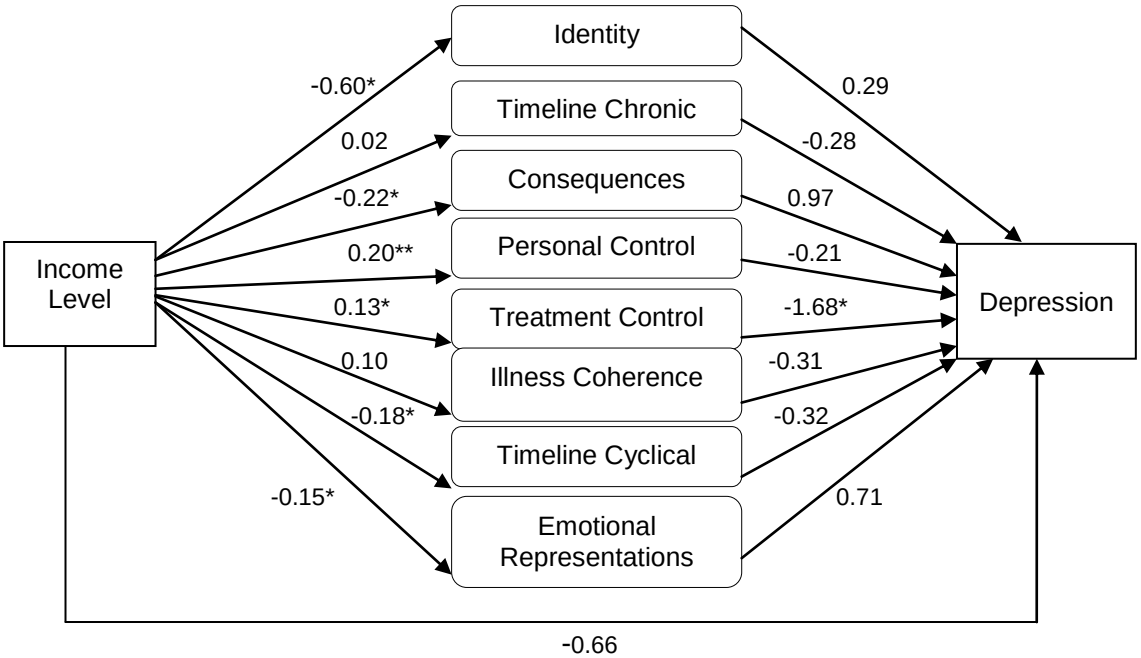


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.35 Direct, total and specific indirect effects of income level and illness perceptions on QoL (depression) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.66	-1.76	0.08	-1.3959	0.0810
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.74			-1.2593	-0.3161
Specific indirect effects					
Identity	-0.17			-0.5277	0.0092
Timeline Chronic	-0.007			-0.1576	0.0454
Consequences	-0.21			-0.5878	-0.0004
Personal Control	-0.04			-0.2705	0.1343
Treatment Control	-0.22			-0.6279	-0.0123
Illness Coherence	-0.03			-0.2224	0.0513
Timeline Cyclical	0.06			-0.0683	0.3032
Emotional Representations	-0.11			-0.4026	0.0050

Figure 8.18 Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by illness perceptions in COPD adjusted for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

b. Was the relationship between SES and QoL mediated by self-efficacy?

Results suggested self-efficacy mediated the relationship between SES (in terms of income level) and all QoL domains except for dyspnoea - when adjusting for disease severity (see Tables 8.36-8.41 and Figures 8.19-8.24). Unadjusted analyses are presented in Appendix F11.

Results indicated that self-efficacy mediated:

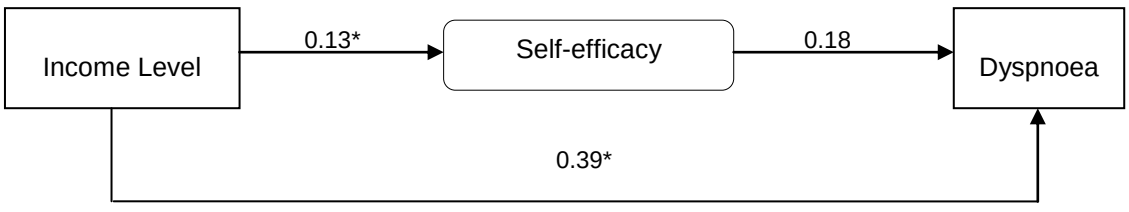
- the relationship between income level and fatigue. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower perceived fatigue. Income level and the mediator accounted for 6% of the variance in fatigue (R^2=0.06, F(2,173)=5.40; p=0.005). Details on the coefficients between income level, self-efficacy and fatigue are presented in Table 8.36 and Figure 8.19;
- the relationship between income level and emotional function. Patients who had higher weekly household income had stronger self-efficacy which was associated with better emotional function. Income level and the mediator accounted for 6% of the variance in emotional function (R^2=0.06, F(2,173)=5.37; p=0.006). Details on the coefficients between income level, self-efficacy and emotional function are presented in Table 8.37 and Figure 8.20;
- the relationship between income level and mastery. Patients who had higher weekly household income had stronger self-efficacy which was associated with stronger perceived mastery. Income level and the mediator accounted for 9% of the variance in mastery (R^2=0.09, F(2,173)=8.93; p=0.0002). Details on the coefficients between income level, self-efficacy and mastery are presented in Table 8.38 and Figure 8.21;
- the relationship between income level and anxiety. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower risk of anxiety. Income level and the mediator accounted for 8% of the variance in anxiety (R^2=0.08, F(2,173)=7.03; p=0.002). Details on the coefficients between income level, self-efficacy and depression are presented in Table 8.39 and Figure 8.22;

- the relationship between income level and depression. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower risk of depression. Income level and the mediator accounted for 8% of the variance in depression (R^2=0.08, F(2,173)=7.07; p=0.001). Details on the coefficients between income level, self-efficacy and depression are presented in Table 8.40 and Figure 8.23.

Table 8.36 Direct, total and specific indirect effects of income level and self-efficacy on QoL (dyspnoea) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.39	2.89	0.004	0.1222	0.6487
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.02			-0.0088	0.0915

Figure 8.19 Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by self-efficacy in COPD adjusting for disease severity



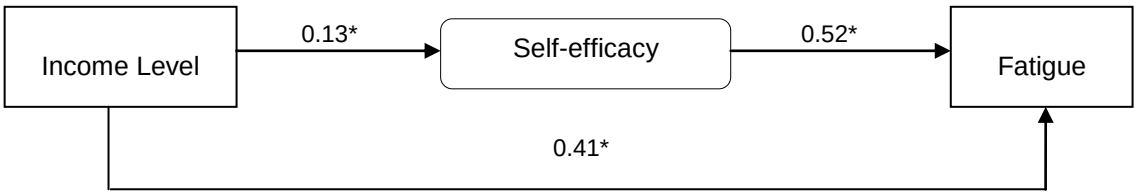
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.37 Direct, total and specific indirect effects of income level and self-efficacy on QoL (fatigue) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.41	2.86	0.005	0.1273	0.6975

Indirect effects	Point estimate	Lower	Upper
Specific indirect effect			
Self-efficacy	0.07	0.0091	0.1730

Figure 8.20 Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by self-efficacy in COPD adjusting for disease severity

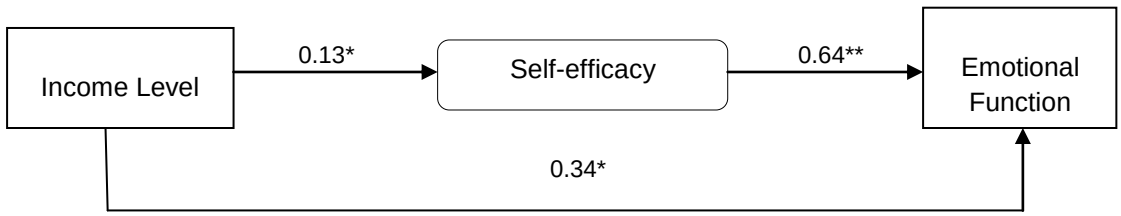


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.38 Direct, total and specific indirect effects of income level and self-efficacy on QoL (emotional function) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.34	2.72	0.007	0.0931	0.5834
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.08			0.0080	0.2063

Figure 8.21 Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by self-efficacy in COPD adjusting for disease severity

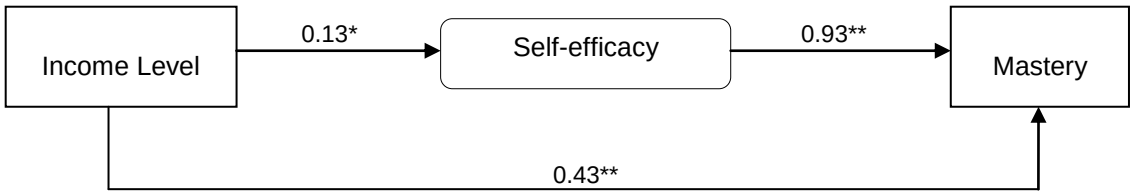


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.39 Direct, total and specific indirect effects of income level and self-efficacy on QoL (mastery) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.43	3.24	0.001	0.1694	0.6960
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.12			0.0198	0.2826

Figure 8.22 Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by self-efficacy in COPD adjusting for disease severity

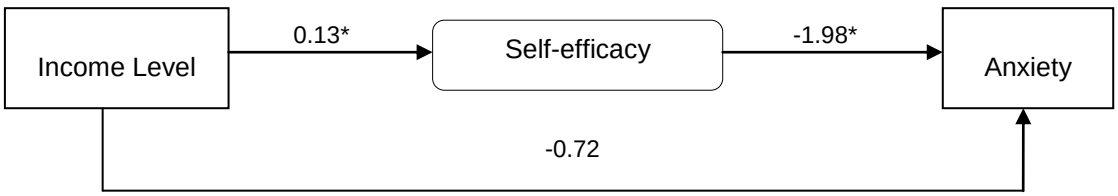


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.40 Direct, total and specific indirect effects of income level and self-efficacy on QoL (anxiety) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.72	-1.59	0.11	-1.6111	0.1757
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	-0.25			-0.6633	-0.0304

Figure 8.23 Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by self-efficacy in COPD adjusting for disease severity

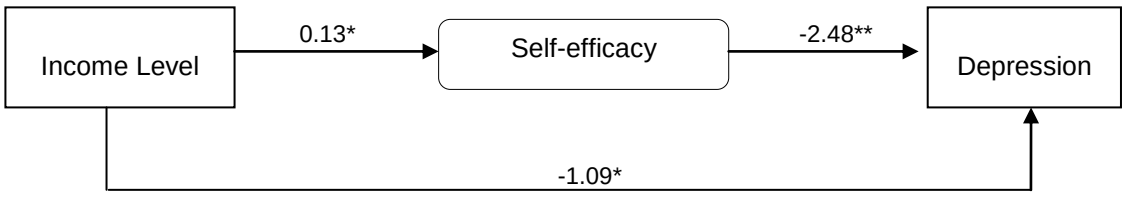


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.41 Direct, total and specific indirect effects of income level and self-efficacy on QoL (depression) in COPD when adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-1.09	-2.99	0.003	-1.8037	-0.3705
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	-0.31			-0.7261	-0.0295

Figure 8.24 Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by self-efficacy in COPD adjusting for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

b. Was the relationship between SES and QoL mediated by social capital?

Findings indicated that social capital partially mediated the relationship between SES and all certain QoL domains. Results are presented in Tables 8.42-8.47 and in Figures 8.25-8.30. Unadjusted analyses are presented in Appendix F11.

Social capital did not mediate the relationship between income level and dyspnoea. Details on the coefficients between income level, social capital and fatigue are presented in Table 8.42 and Figure 8.25.

Results indicated that social capital partially mediated:

- the relationship between income level and fatigue through feelings of trust and safety and value of life. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with lower levels of fatigue. Income level and the mediators accounted for 6% of the variance in fatigue (R^2=0.06, F(2,173)=5.40; p=0.005). No other social capital dimension mediated this relationship. Details on the coefficients between income level, social capital and fatigue are presented in Table 8.43 and Figure 8.26;
- the relationship between income level and emotional functioning through feelings of trust and safety and value of life. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with better emotional functioning. Income level and the mediators accounted for 6% of the variance in depression (R^2=0.06, F(2,173)=5.40; p=0.005). No other social capital dimension mediated this relationship. Details on the coefficients between income level, social capital and emotional functioning are presented in Table 8.44 and Figure 8.27;
- the relationship between income level and mastery through feelings of trust and safety. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety which were associated with greater mastery. Income level and the mediator accounted for 9% of the variance in mastery (R^2=0.09, F(2,173)=8.93; p=0.0002). No other social capital

dimension mediated this relationship. Details on the coefficients between income level, social capital and mastery are presented in Table 8.45 and figure 8.28;

- the relationship between income level and anxiety through feelings of trust and safety and value of life. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with lower risk of anxiety. Income level and the mediators accounted for 6% of the variance in anxiety (R^2=0.06, F(2,173)=5.40; p=0.005). No other social capital dimension mediated this relationship. Details on the coefficients between income level, social capital and depression are presented in Table 8.46 and figure 8.29;

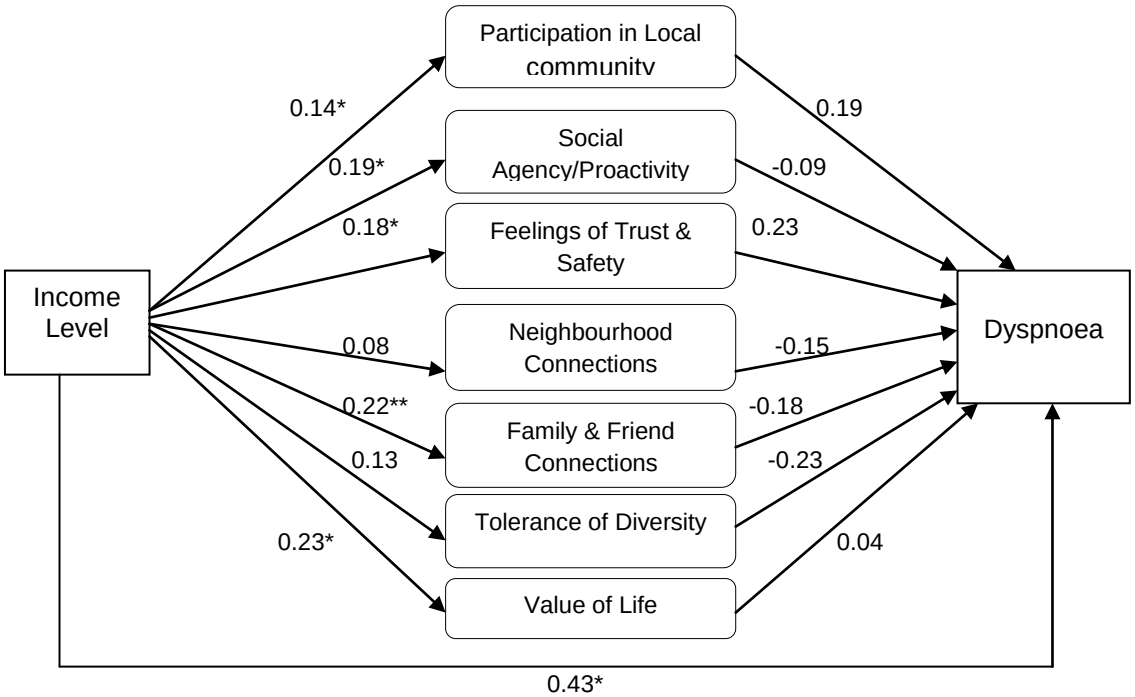
- the relationship between income level and depression through social agency/social proactivity and feelings of trust and safety. Patients who had higher weekly household income were more likely to have been social proactive and have had stronger feelings of trust and safety both of which were associated with lower risk of depression. Income level and the mediators accounted for 8% of the variance in depression (R^2=0.08, F(2,173)=7.07; p=0.001). No other social capital dimension mediated this relationship. Details on the coefficients between income level, social capital and depression are presented in Table 8.47 and Figure 8.30.

Table 8.42 Direct, total and specific indirect effects of income level and social capital on QoL (dyspnoea) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.43	3.07	0.003	0.1529	0.7058

Indirect effects	Point estimate	Lower	Upper
Total	-0.02	-0.1500	0.1075
Specific indirect effects			
Participation in local community	0.03	-0.0057	0.1139
Social Agency/Proactivity	-0.02	-0.1198	0.0574
Feelings of trust & safety	0.04	-0.0035	0.1380
Neighbourhood connections	-0.01	-0.0841	0.0109
Family & friends connections	-0.04	-0.1462	0.0208
Tolerance of diversity	-0.03	-0.1018	0.0034
Value of life	0.008	-0.0553	0.0808

Figure 8.25 Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by social capital in COPD adjusted for disease severity



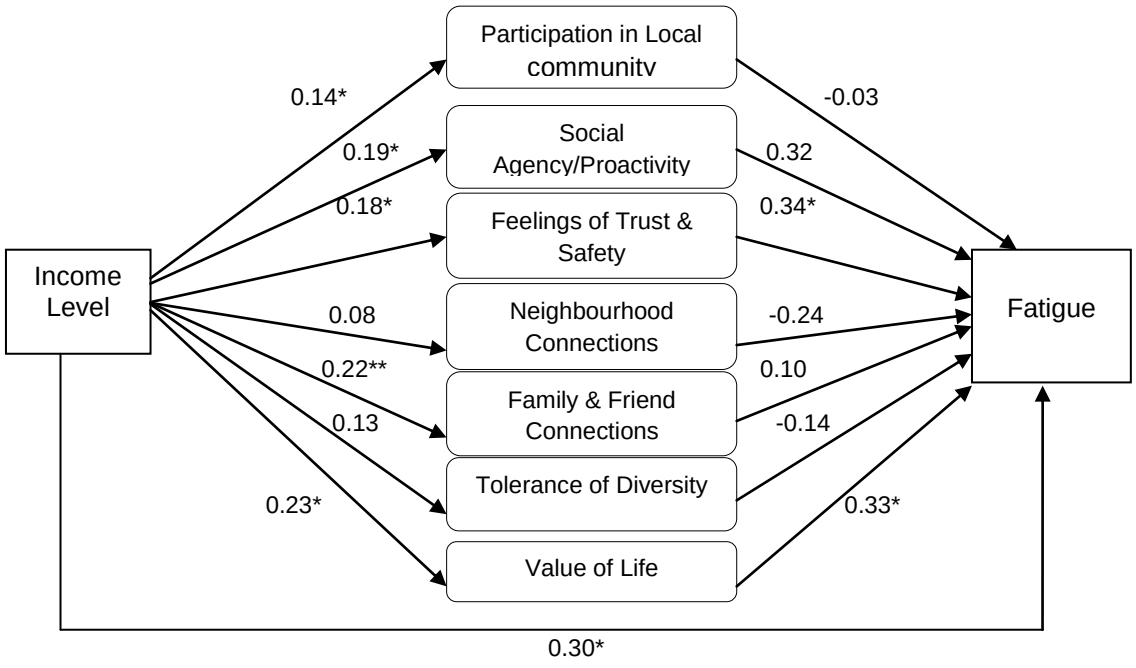
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.43 Direct, total and specific indirect effects of income level and social capital on QoL (fatigue) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.30	2.01	0.05	0.0054	0.6005

Indirect effects	Point estimate	Lower	Upper
Total	0.18	0.0363	0.3567
Specific indirect effects			
Participation in local community	-0.005	-0.0862	0.0472
Social Agency/Proactivity	0.06	-0.0189	0.1760
Feelings of trust & safety	0.06	0.0046	0.1732
Neighbourhood connections	-0.02	-0.0989	0.0101
Family & friends connections	0.02	-0.0625	0.1170
Tolerance of diversity	-0.02	-0.0888	0.0110
Value of life	0.07	0.0090	0.2081

Figure 8.26 Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by social capital in COPD adjusted for disease severity



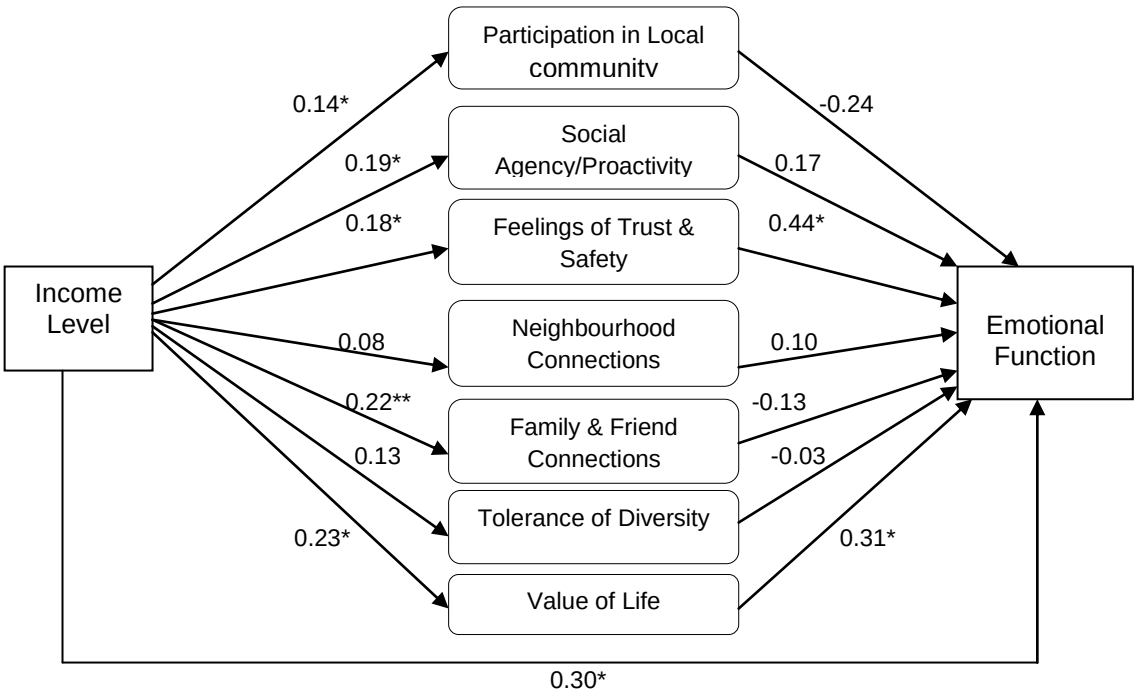
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.44 Direct, total and specific indirect effects of income level and social capital on QoL (emotional function) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.30	2.33	0.02	0.0452	0.5509

Indirect effects	Point estimate	Lower	Upper
Total	0.12	-0.0271	0.2825
Specific indirect effects			
Participation in local community	-0.03	-0.1343	0.0045
Social Agency/Proactivity	0.03	-0.0288	0.1221
Feelings of trust & safety	0.08	0.0159	0.1897
Neighbourhood connections	0.008	-0.0119	0.0754
Family & friends connections	-0.03	-0.1295	0.0341
Tolerance of diversity	-0.004	-0.0501	0.0303
Value of life	0.07	0.0112	0.1832

Figure 8.27 Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by social capital in COPD adjusted for disease severity



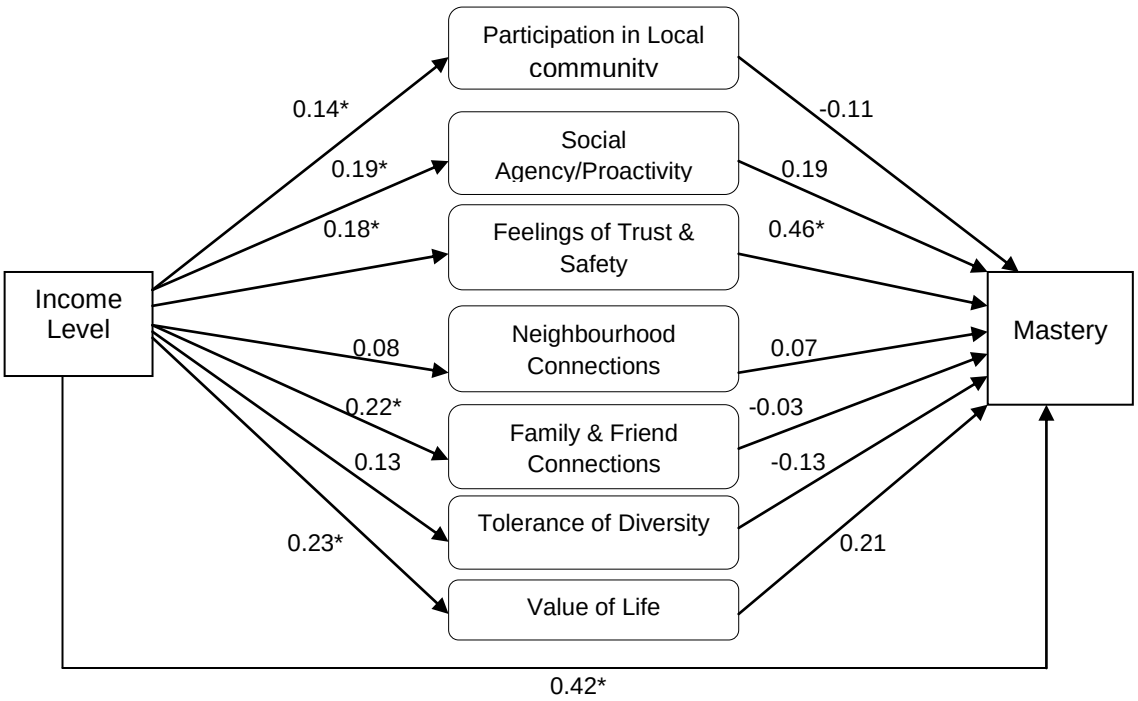
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.45 Direct, total and specific indirect effects of income level and social capital on QoL (mastery) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.42	2.85	0.005	0.1285	0.7101

Indirect effects	Point estimate	Lower	Upper
Total	0.13	-0.0091	0.3000
Specific indirect effects			
Participation in local community	-0.02	-0.0902	0.0166
Social Agency/Proactivity	0.03	-0.0310	0.1471
Feelings of trust & safety	0.08	0.0137	0.1950
Neighbourhood connections	0.005	-0.0181	0.0645
Family & friends connections	-0.007	-0.1051	0.0669
Tolerance of diversity	-0.02	-0.0860	0.0158
Value of life	0.05	-0.0049	0.1515

Figure 8.28 Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by social capital in COPD adjusted for disease severity



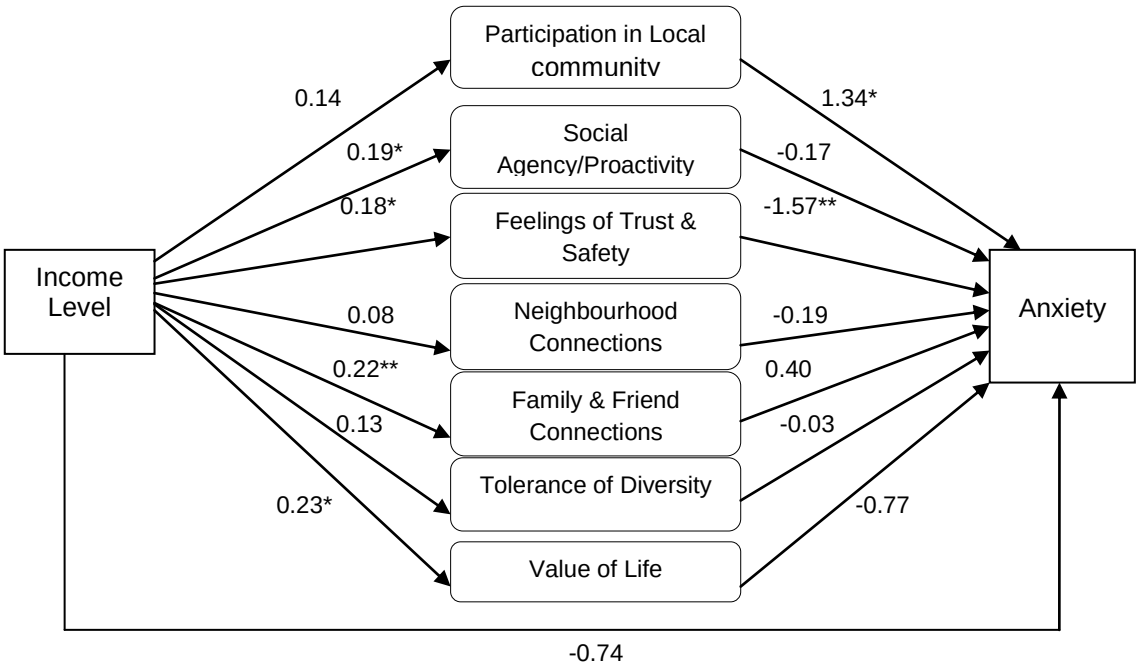
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.46 Direct, total and specific indirect effects of income level and social capital on QoL (anxiety) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.74	-1.66	0.10	-1.6207	0.1421

Indirect effects	Point estimate	Lower	Upper
Total	-0.23	-0.7882	0.2598
Specific indirect effects			
Participation in local community	0.19	-0.0004	0.5801
Social Agency/Proactivity	-0.03	-0.3120	0.2024
Feelings of trust & safety	-0.28	-0.6619	-0.0584
Neighbourhood connections	-0.02	-0.2158	0.0640
Family & friends connections	0.09	-0.1439	0.4117
Tolerance of diversity	-0.004	-0.1721	0.1117
Value of life	-0.18	-0.5252	-0.0122

Figure 8.29 Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by social capital in COPD adjusted for disease severity

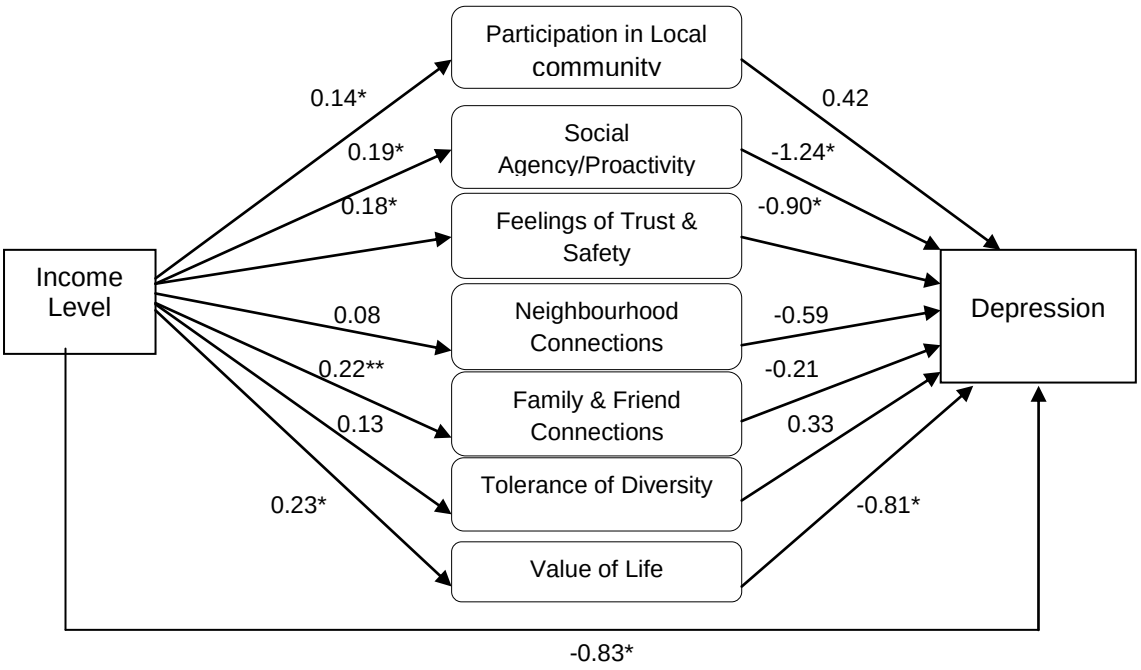


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.47 Direct, total and specific indirect effects of income level and social capital on QoL (depression) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.83	-2.20	0.03	-1.5785	-0.0854
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.57			-1.0954	-0.1338
Specific indirect effects					
Participation in local community	0.06			-0.0182	0.3050
Social Agency/Proactivity	-0.23			-0.5381	-0.0551
Feelings of trust & safety	-0.16			-0.4553	-0.0201
Neighbourhood connections	-0.05			-0.2740	0.0243
Family & friends connections	-0.05			-0.2901	0.1951
Tolerance of diversity	0.04			-0.0444	0.2058
Value of life	-0.19			-0.4859	0.0149

Figure 8.30 Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by social capital in COPD adjusted for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

8.7.4 Summary

i. The relationship between SES and HCA was mediated by illness perceptions and social capital but not by self-efficacy when adjusting for disease severity:

- Illness perceptions:

Treatment control mediated the relationship between educational level and regular spirometry. Participants who had higher education were more likely to have had stronger perceptions of treatment control which were associated with lower likelihood of having regular spirometry. No other illness perception mediated this relationship.

- Self-efficacy:

The relationship between SES and HCA was not mediated by self-efficacy.

- Social capital:

Value of life mediated the relationship between income level and smoking cessation referrals. Participants who had higher income were more likely to have stronger perceptions of value of life which were associated with higher likelihood of smoking cessation referrals. No other social capital dimension mediated this relationship.

ii. The relationship between SES and QoL was mediated by illness perceptions, self-efficacy and social capital when adjusting for disease severity:

- Illness perceptions:

Identity and consequences mediated the relationship between income level and dyspnoea. Patients who had higher weekly household income were more likely to report weaker identity perceptions and weaker consequence beliefs which were associated with lower levels of perceived dyspnoea.

Consequences and personal control mediated the relationship between income level and fatigue. Patients who had higher weekly household income were more likely to

report weaker consequence beliefs and stronger perceptions of personal control which were associated with lower levels of perceived fatigue.

Identity, personal control and emotional representations mediated the relationship between income level and mastery. Patients who had higher weekly household income were more likely to report weaker identity perceptions, stronger perceptions of personal control and weaker emotional representations all of which were associated with stronger perceived mastery.

Identity and emotional representations mediated the relationship between income level and emotional functioning. Patients who had higher weekly household income were more likely to report weaker identity beliefs and weaker emotional representations which were associated with better emotional function.

Emotional representations mediated the relationship between income level and anxiety. Patients who had higher weekly household income were more likely to report weaker emotional representations which were associated with lower risk of anxiety.

Consequences and treatment control mediated the relationship between income level and depression. Participants who had higher income were more likely to have stronger perceived consequences and treatment control beliefs which were associated with lower risk of depression.

- Self-efficacy:

Self-efficacy mediated the relationship between income level and fatigue. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower perceived fatigue.

Self-efficacy mediated the relationship between income level and mastery. Patients who had higher weekly household income had stronger self-efficacy which was associated with stronger perceived mastery.

Self-efficacy mediated the relationship between income level and emotional functioning. Patients who had higher weekly household income had stronger self-efficacy which was associated with better emotional function.

Self-efficacy mediated the relationship between income level and anxiety. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower risk of anxiety.

Self-efficacy mediated the relationship between income level and depression. Patients who had higher weekly household income had stronger self-efficacy which was associated with lower risk of depression.

- Social capital:

Feelings of trust and safety and value of life partially mediated the relationship between income level and fatigue. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with lower levels of fatigue.

Feelings of trust and safety partially mediated the relationship between income level and mastery. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety which were associated with greater mastery.

Feelings of trust and safety and value of life partially mediated the relationship between income level and emotional functioning. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with better emotional functioning.

Feelings of trust and safety and value of life partially mediated the relationship between income level and anxiety. Patients who had higher weekly household income were more likely to have had stronger feelings of trust and safety as well as higher value of life both of which were associated with lower risk of anxiety.

Social agency/social proactivity and feelings of trust and safety partially mediated the relationship between income level and depression. Patients who had higher weekly household income were more likely to have been social proactive and have had stronger feelings of trust and safety both of which were associated with lower risk of depression.

8.7.5 Was the relationship between SES and QoL mediated by a combination of psychosocial variables?

Additional mediation analyses were conducted to examine whether a combination of the psychosocial variables (illness perceptions, self-efficacy and/or social capital) that (partially) mediated the relationship between SES and HCA and SES (Tables 8.48-8.51 and Figures 8.31-8.34) would do so when examined together. This was done in order to examine whether a combination of the psychosocial variables would be able to explain a greater amount of the variance in HCA and QoL.

- SES and HCA

Illness perceptions (treatment control) and social capital (value of life) mediated the relationship between SES (in terms of income level and educational attainment) and HCA (smoking cessation referrals and regular spirometry) individually in previous analyses (see Section 8.4). When treatment control and value of life were examined in combination as suggested mediators in the relationship between SES (in terms of income level and educational attainment) and HCA (smoking cessation referrals and regular spirometry), they did not mediate this relationship.

- SES and QoL

The significant relationships between SES (in terms of income level) and QoL (fatigue, emotional function, mastery, depression) found in previous analyses were mediated by a combination of psychosocial variables (illness perceptions, self-efficacy and/or social capital).

When examined in combination, results indicated that:

a. The suggested variables examined as mediators in the relationship between SES (income level) and QoL (fatigue) were illness perceptions (consequences, personal control), self-efficacy and social capital (feelings of trust and safety, value of life). Results showed that income level and fatigue were mediated by:

   - consequences. Patients who had higher weekly household income were more likely to report weaker consequence perceptions which were associated with lower levels of perceived fatigue. Income level and the mediator accounted for 6% of the variance in fatigue (R^2=0.06, F(2,173)=5.40; p=0.005). Remaining

illness perceptions (personal control), self-efficacy and social capital (feelings of trust and safety, value of life) did not mediate this relationship. Details on the coefficients between income level, illness perceptions, self-efficacy, social capital and fatigue are presented in Table 8.48 and Figure 8.31.

b. The suggested variables examined as mediators in the relationship between SES (income level) and QoL (emotional functioning) were illness perceptions (identity, emotional representations), self-efficacy and social capital (feelings of trust and safety, value of life). Results showed that income level and emotional functioning were mediated by:

   - identity, emotional representations and self-efficacy. Patients who had higher weekly household income were more likely to report weaker identity perceptions and emotional representations but stronger self-efficacy all of which were associated with better emotional function. Income level and the mediators accounted for 6% of the variance in emotional functioning (R^2=0.06, F(2,173)=5.37; p=0.006). Social capital (feelings of trust and safety, value of life) did not mediate this relationship. Details on the coefficients between income level, illness perceptions, self-efficacy, social capital and emotional functioning are presented in Table 8.49 and Figure 8.32.

c. The suggested variables examined as mediators in the relationship between SES (income level) and QoL (mastery) were illness perceptions (identity, personal control, emotional representations), self-efficacy and social capital (feelings of trust and safety, value of life). Results showed that income level and mastery were mediated by:

   - identity, personal control, emotional representations and self-efficacy. Patients who had higher weekly household income were more likely to report weaker identity perceptions, weaker emotional representations but stronger personal control and self-efficacy all of which were associated with higher perceived mastery irrespectively of severity of COPD. Income level and the mediators accounted for 9% of the variance in mastery (R^2=0.09, F(2,173)=8.93; p=0.0002). Social capital (feelings of trust and safety, value of life) did not mediate this relationship. Details on the coefficients between income level, illness perceptions, self-efficacy, social capital and mastery are presented in Table 8.50 and Figure 8.33.

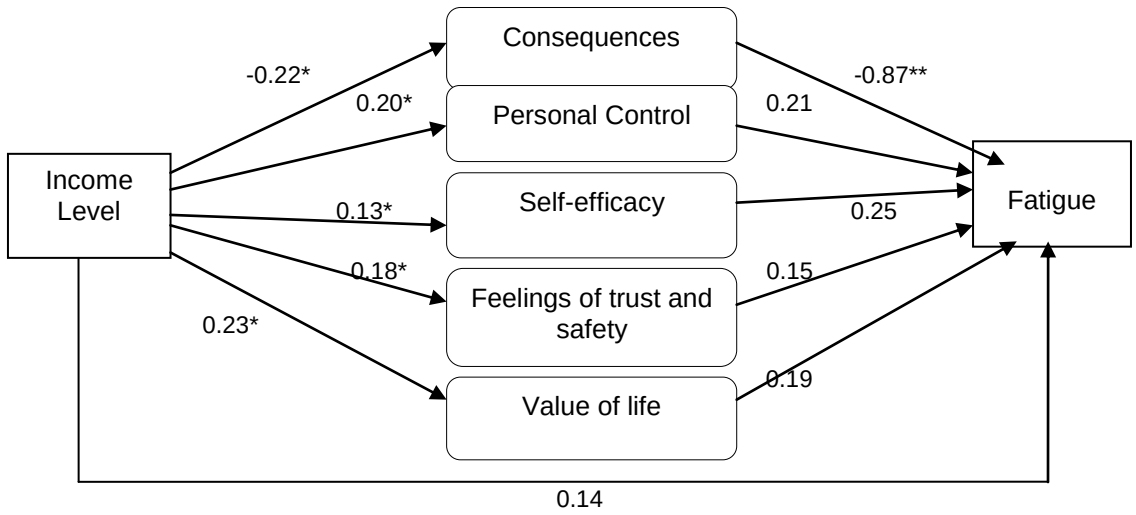
d. The suggested variables examined as mediators in the relationship between SES (income level) and QoL (depression) were illness perceptions (consequences, treatment control), self-efficacy and social capital (social agency/proactivity, feelings of trust and safety). Results showed that income level and depression were mediated by:

- consequences, self-efficacy and social agency/social proactivity. Patients who had higher weekly household income were more likely to have stronger perceived self-efficacy and higher levels of social agency/proactivity but weaker perceived consequences all of which were associated with lower risk of depression unaffected by severity of COPD. Income level and the mediators accounted for 8% of the variance in depression (R^2=0.08, F(2,173)=7.07; p=0.001). Remaining dimensions of illness perceptions (treatment control) social capital (feelings of trust and safety) did not mediate this relationship. Details on the coefficients between income level, illness perceptions, self-efficacy, social capital and depression are presented in Table 8.51 and Figure 8.34.

Table 8.48 Direct, total and specific indirect effects of income level and illness perceptions, self-efficacy and social capital on QoL (fatigue) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.14	1.06	0.29	-0.1228	0.4064
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.34			0.1715	0.5205
Specific indirect effects					
Consequences	0.19			0.0742	0.3467
Personal Control	0.04			-0.0017	0.1224
Self-efficacy	0.03			-0.0033	0.1137
Feelings of trust and safety	0.03			-0.0152	0.1171
Value of life	0.04			-0.0062	0.1399

Figure 8.31 Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by illness perceptions, self-efficacy and social capital in COPD adjusted for disease severity



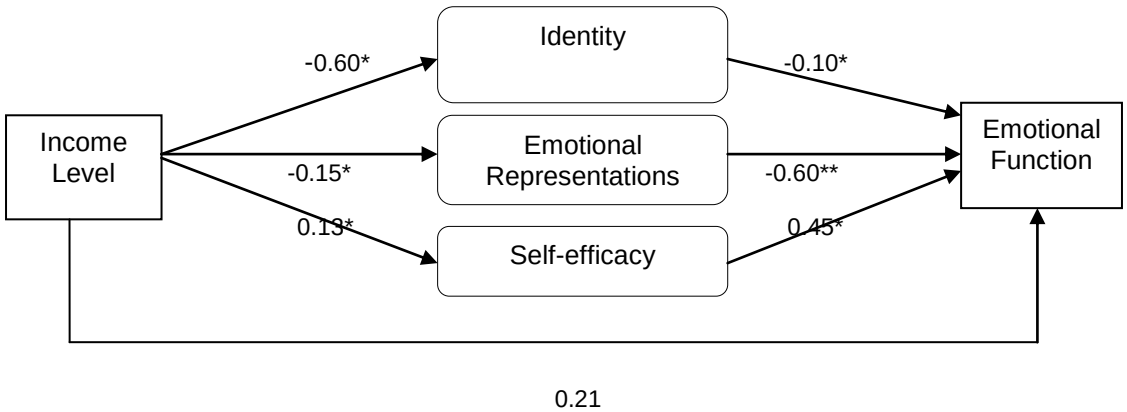
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.49 Direct, total and specific indirect effects of income level, illness perceptions and self-efficacy on QoL (emotional function) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.21	1.86	0.06	-0.0127	0.4305

Indirect effects	Point estimate	Lower	Upper
Total	0.21	0.0774	0.3595
Specific indirect effects			
Identity	0.06	0.0123	0.1420
Emotional representations	0.09	0.0177	0.2054
Self-efficacy	0.06	0.0057	0.1659

Figure 8.32 Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by illness perceptions and self-efficacy in COPD adjusted for disease severity

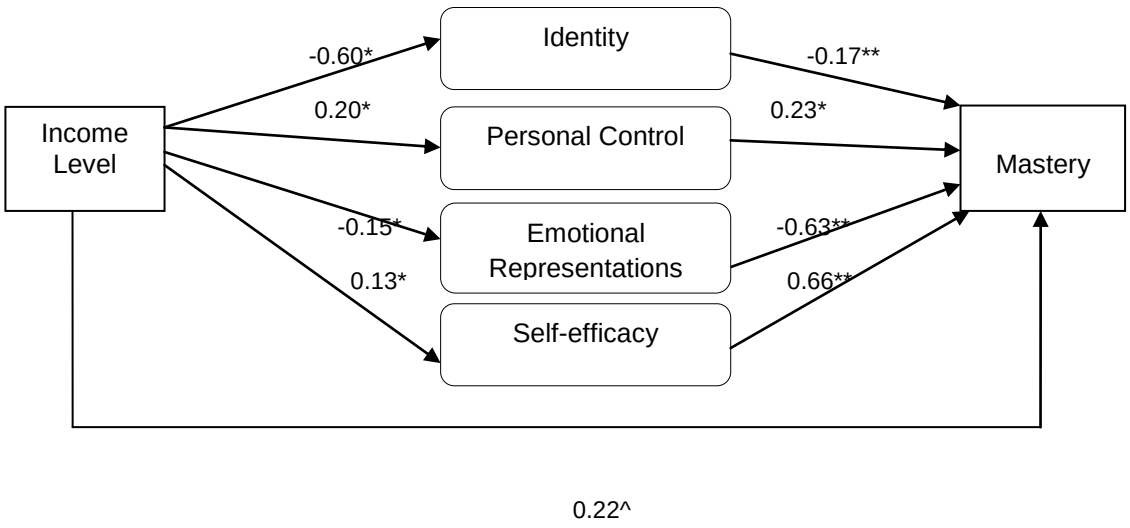


** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.50 Direct, total and specific indirect effects of income level, illness perceptions and self-efficacy on QoL (mastery) in COPD adjusted for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.22	1.93	0.0055	-0.0048	0.4469
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.33			0.1501	0.5333
Specific indirect effects					
Identity	0.10			0.0325	0.2160
Personal Control	0.05			0.0040	0.1237
Emotional representations	0.10			0.0111	0.2273
Self-efficacy	0.08			0.0138	0.2019

Figure 8.33 Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by illness perceptions and self-efficacy in COPD adjusted for disease severity



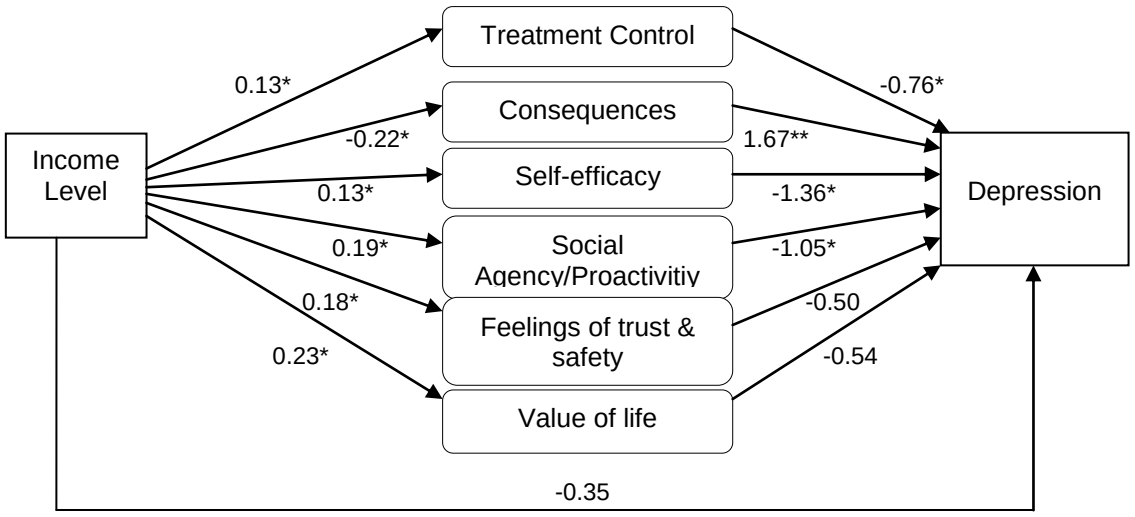
** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

Table 8.51 Direct, total and specific indirect effects of income level, illness perceptions, self-efficacy and social capital on QoL (depression) in COPD adjusting for disease severity

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.35	-1.02	0.31	-1.0338	0.3295

Indirect effects	Point estimate	Lower	Upper
Total	-1.05	-1.6587	-0.5229
Specific indirect effects			
Consequences	-0.37	-0.7072	-0.1400
Treatment Control	-0.10	-0.3059	0.0155
Self-efficacy	-0.17	-0.4686	-0.0177
Social Agency/social proactivity	-0.19	-0.4590	-0.0383
Feelings of trust and safety	-0.09	-0.3253	0.0103
Value of life	-0.12	-0.3587	0.0024

Figure 8.34 Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by illness perceptions, self-efficacy and social capital in COPD adjusted for disease severity



** significant at p< 0.05; **significant at p< 0.001; ^ significant at p< 0.1*

8.7.6 Summary

Results indicated that the effect of SES on QoL was indeed mediated by a combination of different dimensions of illness perceptions and social capital as well as self-efficacy.

8.8 Overall summary of findings

The main points which emerged after all the statistical analyses were completed were:

a. More deprived COPD patients in terms of IMD score were found to have greater access to health care in terms of smoking cessation referrals as compared to less deprived COPD patients. More deprived COPD patients in terms of educational level were also found more likely to have had regular spirometry compared to participants who were less deprived (post-secondary education) who did not have regular spirometry. Neither of these relationships was significantly associated with disease severity.

b. Higher SES was associated with better QoL. More deprived participants (in terms of Income level) were more likely to report poorer QoL (dyspnoea, fatigue, mastery, emotional functioning, anxiety and depression risk).

c. The overall influence of SES over HCA and QoL in COPD seemed to be minor. The relationship between SES and HCA and QoL in COPD were not as strong as expected. Thus, mediation analyses provided fairly limited information in explaining these relationships. A larger sample size would probably not have increased the likelihood of stronger findings due to the limited strength of these relationships.

d. Illness perceptions were found to have a stronger relationship with QoL and a more consistent relationship with HCA but that was independent of SES.

e. Self-efficacy did not mediate the relationship between SES and HCA. Illness perceptions (treatment control) mediated the relationship between SES (in terms of educational level) and HCA (regular spirometry). Social capital (value of life) mediated the relationship between SES (In terms of IMD score) and HCA (smoking cessation referral.

f. Illness perceptions mediated the relationship between SES (in terms of income level) and all QoL domains (dyspnoea, fatigue, mastery, emotional functioning, anxiety and depression). Self-efficacy and social capital mediated the relationship between SES (in terms of income level) and all QoL except for dyspnoea.

g. When the proposed mediators (illness perceptions, self-efficacy and social capital) were examined as mediators in the relationship between SES and QoL in combination, mediation patterns changed. This suggested that there might have been substantial collinearity between some of the mediators.

h. There exists an increased possibility that one or more statistically significant findings could be false positives (Type 1 errors) due to the large number of statistical tests of association and mediation that were conducted in this thesis. This is discussed in more detail in the discussion chapter (Chapter 9).

Figure 8.35 Significant associations between SES & healthcare access (HCA), quality of life (QoL), illness perceptions (IPs), general self-efficacy and social capital (SC)

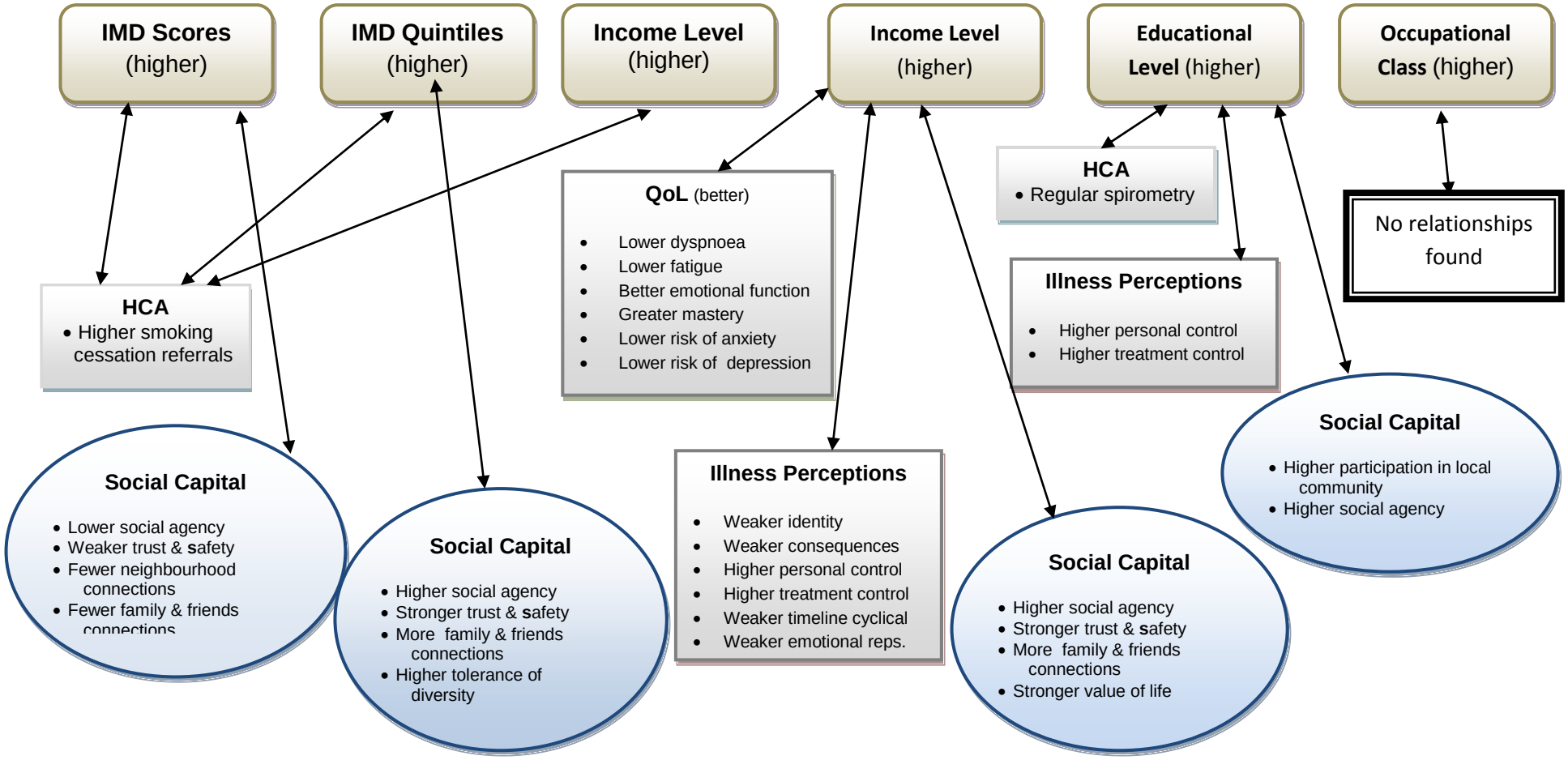


Figure 8.36 Significant associations between healthcare access (HCA) and illness perceptions (IPs), general self-efficacy (GSE) and social capital (SC)

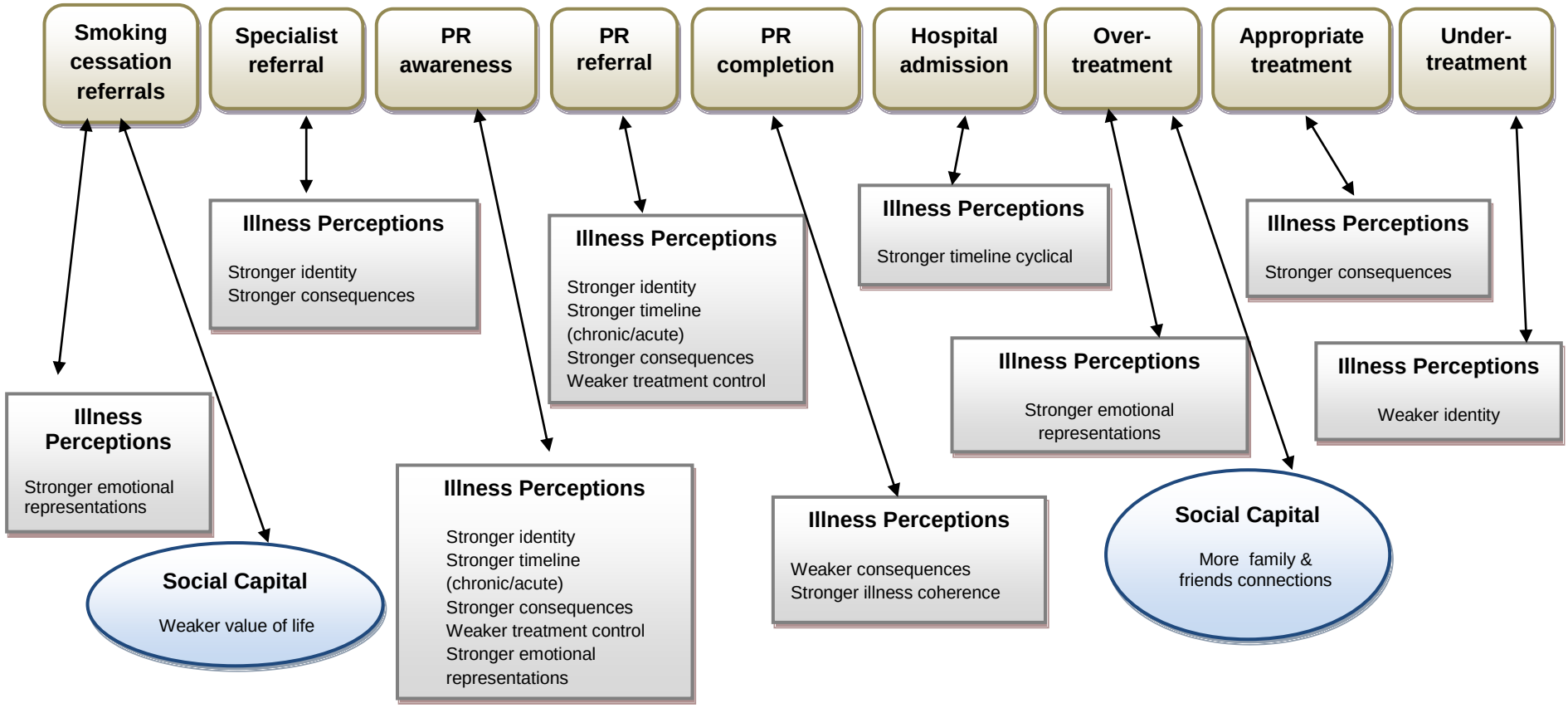


Figure 8.37 Significant associations between quality of life (QoL), illness perceptions (IPs), general self-efficacy (GSE) and social capital (SC)

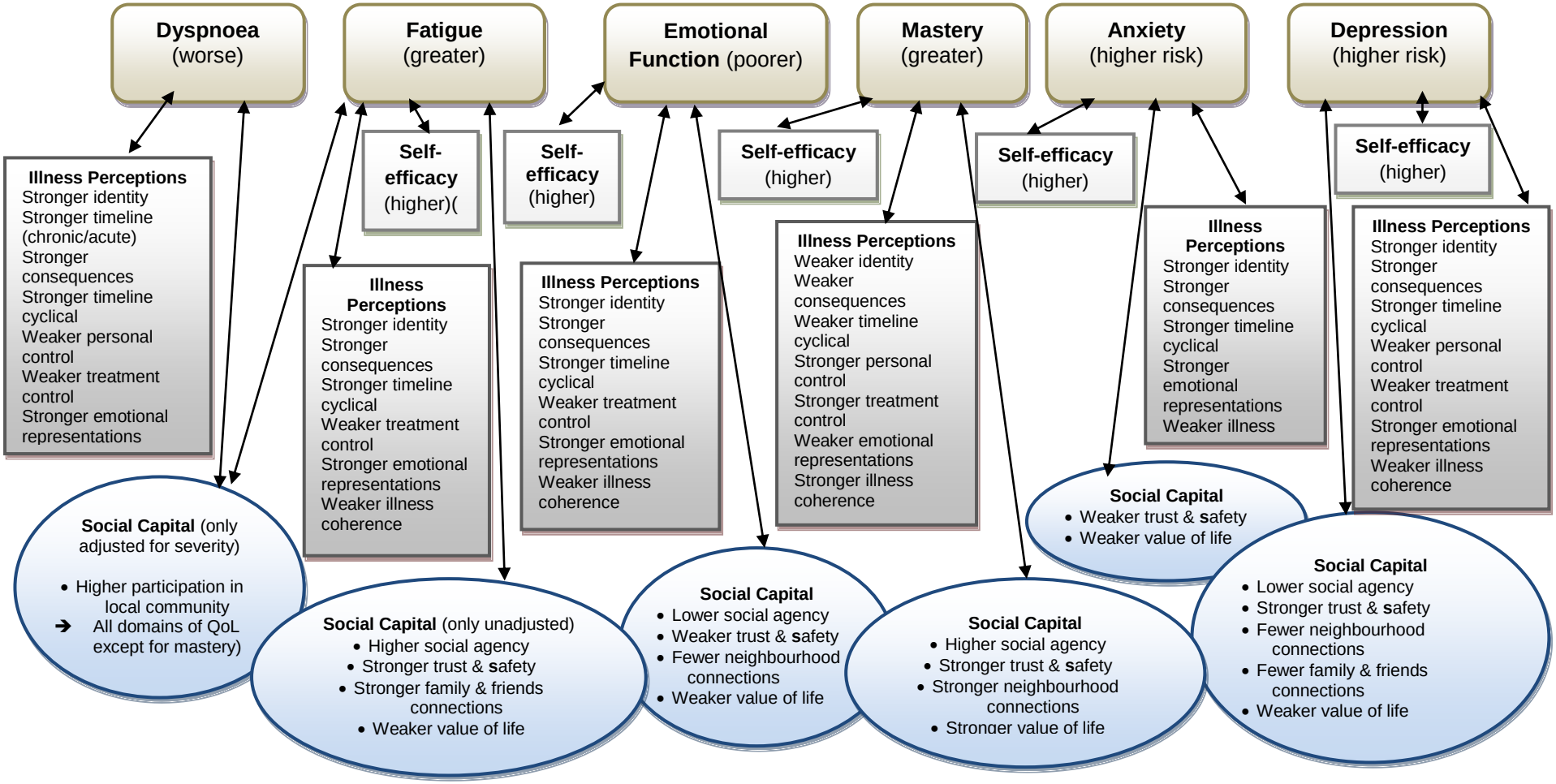
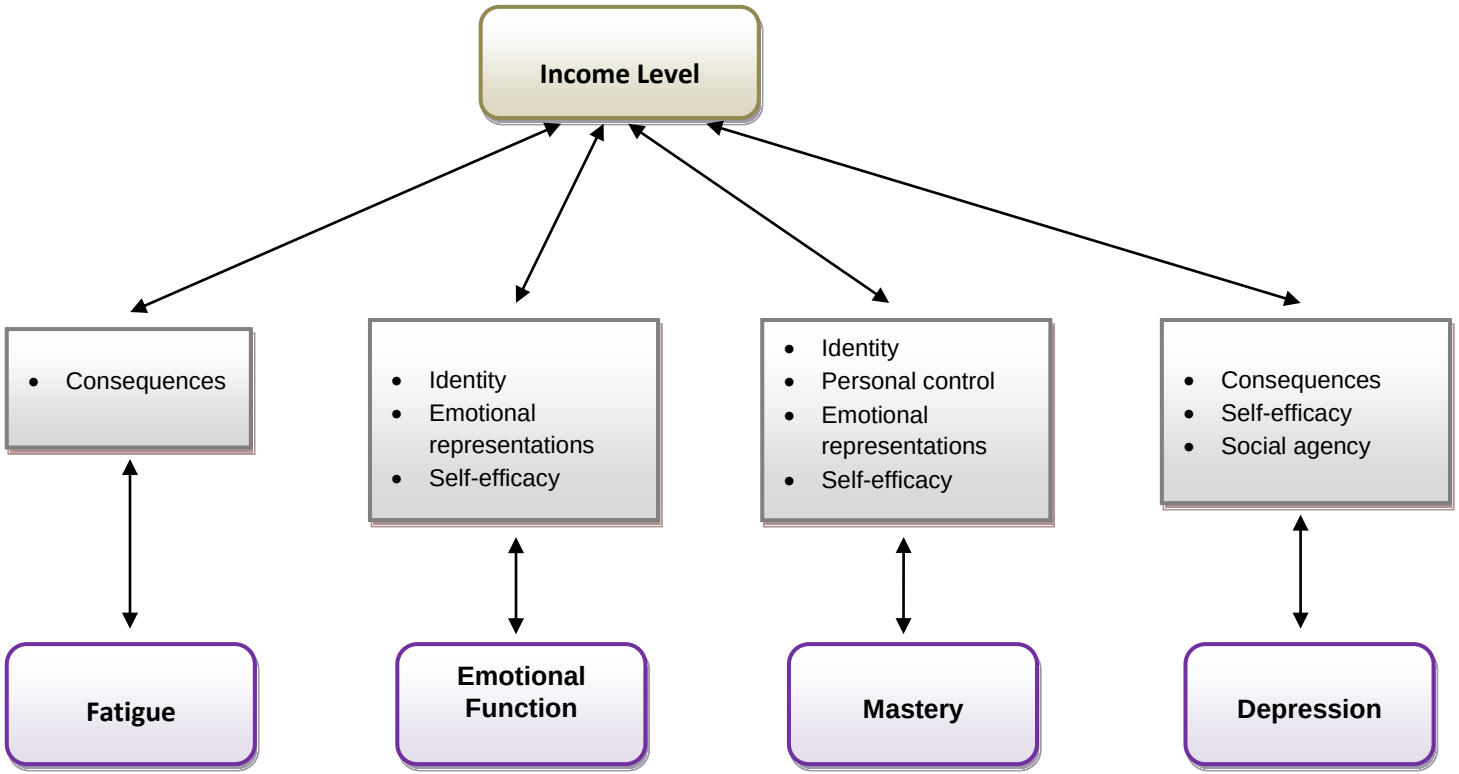


Figure 8.38 Variables mediating the relationship between SES (income level) & QoL



Chapter 9

Discussion

9.1 Overview and key findings

This research is the first to examine whether lower SES was associated with lower HCA and poorer QoL in patients with COPD. This was done in a rigorous and robust way through examination of patients recruited in a population sample and adjusting for disease severity in the analyses. Additional objectives included examining whether (a) psychosocial variables – illness perceptions, self-efficacy and social capital – and SES were associated with HCA and QoL and (b) the role of these psychosocial variables as possible mediators in the relationships between SES and HCA and QoL. Lack of associations is as important as positive associations. For example, the finding that low SES was significantly associated with greater HCA in patients with COPD contributes to increasing our understanding of the role of SES within HCA. If HCA is not affected by the degree of deprivation, then this leads to the development of new assumptions regarding health inequalities and health care access in the context of COPD. The main study findings and the questions that arise are presented below. Proposed explanations, arguments and critical appraisal as well as comparison to existing literature are discussed later in this chapter.

It was explored whether low SES was significantly associated with lower HCA in patients with COPD. Findings indicated that more deprived patients with COPD had greater HCA compared to more affluent patients regarding access to health care. Additional significant relationships between SES and HCA included lower SES in terms of educational level and more regular spirometry. Was this lack of association due to a flaw in the present research e.g. SES or HCA measures, or did it indeed reflect the real situation? The widespread assumption was the existence of socio-economic inequalities in HCA in patients with COPD; more deprived people were believed to be at greater disadvantage in accessing the health care services they required. Findings suggested that higher deprivation was not a barrier to greater HCA.

It was also explored whether SES was significantly associated with QoL in patients with COPD. Patients who were more deprived in terms of income level did report

significantly worse QoL compared to their more affluent counterparts, unaffected by disease severity. Lower SES in terms of remaining measures i.e. IMD, educational level and occupational class was not found to be significantly associated with worse QoL compared to higher SES. The fact that income level and not the other SES measures was found to be significantly associated with QoL in COPD suggested that income level could be a more sensitive and appropriate SES measure in this patient population.

It was examined whether disease severity was associated with HCA and QoL in COPD. Additionally, it was investigated whether disease severity was patterned according to SES. Disease severity was not significantly related to any of the SES measures suggesting that more deprived patients were not more likely to report greater disease severity compared to their more affluent counterparts. All analyses were adjusted for disease severity in case of any residual confounding. This would ensure that differences in HCA and/or QoL in people with lower vs higher SES were not due to SES or severity of COPD. More severely affected COPD patients did not differ significantly in terms of HCA and QoL and on most psychosocial measures compared to their less severely affected counterparts. The lack of an association between disease severity and QoL was consistent with previous research in neuromuscular disease (Graham, Rose, Grunfeld, Kyle, & Weinman, 2011) highlighting the complexity of emotional and psychological functioning. The relationships that were influenced by disease severity showed that more severely affected COPD patients were more likely (1) to have been aware of pulmonary rehabilitation programmes and (2) to have been referred for pulmonary rehabilitation and (3) less severely affected COPD patients were more likely to have been over-treated. Disease severity (in terms of lung function) was also significantly associated with timeline cyclical. Participants who had more severe COPD perceived that their illness was following a cyclical course alternating between times of stability of symptoms and exacerbations. More severely affected patients did not differ significantly in terms of the remaining illness perceptions dimensions or self-efficacy and social capital in comparison to less severely affected patients.

It was explored whether SES was associated with illness perceptions, self-efficacy and social capital. No significant association was found between SES and self-efficacy. More deprived COPD patients in terms of IMD, income and educational level and occupational class did not differ significantly in self-efficacy compared to less deprived patients. More deprived patients in terms of educational and income level, but not IMD and occupational class, differed significantly in illness perceptions (identity,

consequences, personal and treatment control, timeline cyclical and emotional representations) compared to their more affluent counterparts. Less deprived patients in terms of IMD, educational and income level and occupational status differed significantly in terms of certain social capital elements in comparison to more deprived patients. Less deprived participants were more likely to report higher social involvement, trust and safety as well as stronger social networks in comparison to more deprived participants. All associations were unaffected by disease severity. In general, patients differed significantly in their social capital levels and less in their illness perceptions on the basis of their SES.

It was further explored whether HCA was related to illness perceptions, self-efficacy and social capital in patients with COPD. Significant differences were found in patients' illness perceptions between groups that differed in terms of HCA (except for regular spirometry). Differences varied depending on HCA outcomes. Overall, participants with more negative cognitions and affect regarding their COPD (e.g. attributing more symptoms to COPD, perceiving a greater impact of COPD on their everyday life) were more likely to have had greater access to health care regardless of disease severity. Patients did not differ significantly in self-efficacy and most elements of social capital according to HCA. Exceptions included smoking cessation and over-treatment. Patients with lower social capital were more likely to have been offered smoking cessation referrals while patients with higher social capital were more likely to have been over-treated irrespective of disease severity.

Was there something special about the way patients viewed their illness that evoked a more proactive response on behalf of physicians, thus securing greater access to health care services? This could possibly be true for some of the HCA outcomes that were physician-centred such as PR or smoking referral. Instead, for HCA outcomes that were patient-centred such as PR completion, more positive illness perceptions were associated with higher completion rates. These findings suggested that illness perceptions played an important role in relation to SES and HCA in COPD. The fact that more deprived patients were not at a disadvantage when accessing health care services suggested that other factors such as patients' illness perceptions might have contributed to this relationship.

It was also explored whether QoL was related to illness perceptions, self-efficacy and social capital in patients with COPD. More negative illness perceptions (e.g. attributing more symptoms to COPD, perceiving COPD to have a greater impact on their

everyday life and feeling less in control over the illness), weaker self-efficacy and lower levels of social capital were associated with poorer QoL (e.g. worse dyspnoea, greater fatigue, higher risk of depression) irrespective of disease severity. Different combinations of all three types of psychosocial variables were associated to some extent with QoL in COPD. The strongest associations were found for QoL and illness perceptions especially identity, consequences and emotional representations. HCA was significantly related to illness perceptions, self-efficacy and some elements of social capital.

Finally, it was explored whether psychosocial variables i.e. illness perceptions, self-efficacy and social capital mediated the relationship between SES and HCA and QoL in patients with COPD. No psychosocial variable mediated the relationship between SES and HCA but a combination of them – illness perceptions, self-efficacy and social capital – significantly mediated the association between SES and QoL. These findings suggested that SES (in terms of income level) exerted its influence on QoL through certain illness perceptions, i.e. identity, consequences, emotional representations and personal control, as well as self-efficacy and less through social capital depending on the outcome examined.

Could these psychosocial variables possibly explain the finding that suggested that more deprived patients with COPD had poorer QoL despite their equal or - in some cases - better access to health care services? This question will be addressed in the following section.

9.2 Discussion of key findings

9.2.1 Was SES associated with HCA?

Lower SES was associated with greater HCA. Additional relationships found support for more deprived COPD patients not having less HCA in comparison to their more affluent counterparts which is consistent with existing literature (see Chapter Four). This was supported by the lack of associations between SES and HCA but also the fact that more deprived patients in terms of educational level were more likely to have been offered more regular spirometry. These relationships indicated that, lower SES was not associated with lower HCA but that, in certain cases, higher deprivation was related to greater health care access.

The aforementioned results are consistent with existing literature. The systematic review conducted as part of this thesis (see Chapter Four) found a small number of quality studies investigating the relationship between SES and HCA. Some of these studies found no evidence of higher deprivation being linked to poorer HCA. Others reported that lower SES was associated with greater HCA. However, there was considerable variability in the conceptualisation and definition of HCA (e.g. discussion about prognosis, quality of emergency care or inhaler variance).

a. What do the associations between SES and HCA suggest and how could the findings be explained?

The question arises whether the lack of associations between low SES and HCA was due to the nature of HCA or SES measures or due to other factors such as doctor or patient characteristics. For example, for certain HCA measures, patients could be considered passive recipients of health care services because these services were physician-initiated, for example PR or smoking referrals. For other HCA measures, patients may have maintained an active and assertive role because they were patient-initiated or patient-dependent such as PR completion. A number of possible explanations are proposed and are presented below.

- Doctor and patient attitudes and their interaction

One possible explanation for the lack of association between SES and HCA is the nature of doctor-patient interaction. Access to health care is not only influenced by patient characteristics but also by clinician characteristics. The quality of communication between these two determines the direction of the outcome of the consultation. Good communication is essential for the quality of health care offered to patients by their providers (Bensing, Verheul, Jansen, & Langewitz, 2010). It increases patients' confidence in their capability to manage their illness and leads to better health status and outcomes such as blood pressure reduction and better glucose control (DeVoe, Wallace, & Fryer, 2009; Stewart, 1995). Within this medical interaction context, the "explanatory model of sickness" holds an important role (Kleinman, 1978). According to this model, both the doctor and the patient have a conceptual construction that explains physical phenomena. This construction consists of the same domains for

both sides (e.g. cause, control, onset of symptoms, prognosis and cure, treatment) but their content varies significantly depending on the agent's perspective of the illness. The doctor's model is based on their clinical behaviour while the patient's model is based on their illness behaviour. These models are influenced by a variety of factors such as socio-economic status, culture, religion or ethnicity (Kleinman, 1978). The higher the congruence between these two models the better the outcome for the patient. However, sometimes congruence is low and this may result in poor doctor-patient communication especially with patients from a low SES background (Schouten, Meeuwesen, & Harmsen, 2009) who had lower satisfaction with the consultation and poorer access to health care (DeVoe, Krois, & Stenger, 2008; 2009). This could be due to doctor or patient characteristics. For example, health care access might be influenced due to doctor bias towards the patient influenced by their perceptions of patients' ethnicity, social class or educational level (Van Ryn, 2002). Doctors perceived lower SES patients more negatively with regard to health and lifestyle behaviours or adherence to their recommendations which influenced their treatment decisions and clinical management (van Ryn & Burke, 2000). Variation in physician perceptions of patients according to ethnic background and socio-economic status was observed even when disease severity was controlled (Hannan, Kilburn, O'Donnell, Lukacik, & Shields, 1991). This suggested that a proportion of the variance in doctor behaviour regarding patient treatment could be explained by differences in their perceptions of their patients (van Ryn & Burke, 2000). In the case of the present study, however, congruence between doctors and their patients might have been higher and not influenced by patients' SES. This could have led to better communication and greater rapport between them and could have secured equal HCA for more deprived and less deprived COPD patients.

Good doctor-patient communication and high congruence of their perceptions could explain the lack of a relationship between lower SES and poorer HCA. Alternatively, more deprived patients might be experiencing more expressive physician attitudes. Because of patients' particular situation i.e. greater need due to financial or educational disadvantage, doctors might be more sympathetic and show greater empathy towards them, thus evoking different responses. For instance, patients' perceptions of their doctors' attitude towards them (e.g. if they are caring and interested) can encourage them to volunteer more information and be more active in the medical interaction as well as become more adherent to medical recommendations (Ben-Sira, 1976, 1988; DiMatteo, Taranta, Friedman, & Prince, 1980; Hall & Dornan, 1988). This could well have been the case here. The significant associations between IMD and educational

level with smoking cessation referrals and regular spirometry, respectively, could have been the result of doctors' attitudes and behaviour influenced by patients' SES. Doctors might have perceived more deprived patients to be more likely to follow their recommendations and/or have greater need for smoking cessation referrals. As a result, more quality health care might have been provided to lower SES patients.

The association between regular spirometry and lower SES in terms of educational attainment could also be a result of patients' choice. Regular spirometry assessment might have been offered to more educated patients but they might not have attended it, possibly because they perceived themselves as being in control over their illness. This perception could have eliminated the perceived need to have their COPD monitored frequently. This was also suggested by the fact that illness perceptions, such as greater personal and treatment control, showed significant associations with higher education. Previous literature suggested that COPD patients with higher educational attainment, as compared to people with fewer years of education, were less likely to follow the treatment regime prescribed by their doctors because they felt the medication was not helping them breathe better (VanderSchaaf et al., 2010). This study focused on medication adherence which is different from spirometry though. However, adherence could be considered as following physician recommendations, i.e. taking the medications as prescribed or attending spirometry. In the present study, patients were asked whether they have regular spirometry. This meant that patients could have been invited for spirometry but chose not to attend which would be compatible with not having regular spirometry. This made it difficult to distinguish whether patients who did not have regular spirometry did so because they had not been invited or because they chose not to.

Lower SES was associated with greater HCA which is consistent with VanderSchaaf's findings (2010). However, the authors emphasized that the results could have been due to more educated patients being more willing to disclose lower adherence to medical recommendations. Methodological differences such as conceptualisation and measurement of HCA could have affected results. For example, VanderSchaaf et al. (2010) assessed medication adherence as number of times of inhaler use in a day. Other studies that defined medication adherence as minutes of use of nebuliser per day found that more educated patients were more likely to follow doctor's recommendations regarding medication use (Turner, et al., 1995).

- Age-related factors

Current findings need to be considered within the context of particular characteristics of the participant sample. For instance, better access to health care in more deprived groups could be due to patients' age. Studies found that elderly patients were more likely to interact with their doctors in a patient-centred style compared to younger patients (Peck, 2011) and preferred a physician-directed style of decision-making (Levinson, Kao, Kuby, & Thisted, 2005). Perhaps participants' age – associated with greater vulnerability - might have influenced doctors' clinical management such as smoking cessation referrals or regular spirometry. However, present results indicated that mean age did not differ significantly in the individual SES measures except for income level (see Chapter Eight). Mean age for medium income level was significantly higher than mean age for low and high income levels. This suggested that age was not likely to have played a role in the relationship between SES and health care access.

- SES measure appropriateness

Occupational status showed no significant associations with health care access in COPD. Participants' age could possibly explain why occupational status might not have been a reliable measure of current SES due to retirement status (Braveman, et al., 2005; Shavers, 2007). More deprived patients in terms of income level were not at a disadvantage for accessing health care services. A possible explanation could be that the health care system in the UK is free of charge at entry point making access independent of an individual's financial status. In addition, integrated and further free health care services are available for people over the age of 60 in the UK such as free prescriptions, and free immunisations, free access to dental services and sight tests and free transportation as part of the National Service Framework (NSF) for older people launched in 2001 (National Service Framework, 2001). Therefore, it would be plausible to assume that the more individual and financial-related SES proxies such as occupational status and income and level might not be linked to HCA in healthcare systems like the NHS.

- Co-morbidities

Could higher health care access in COPD patients in this study possibly be associated with co-morbidity? According to Simon-Tuval et al. (2011), COPD patients reported 3.4 times higher health services utilisation compared to controls. Both the number and the nature of co-morbidities were predictors of increased health care utilisation in COPD but disease severity was not. For example, the presence of specific co-morbidities such as heart disease (myocardial infarct, congestive heart failure), mild liver disease and diabetes mellitus were significantly associated with COPD patients' increased health care use. In the present study 71% of participants reported additional health conditions such as diabetes or cardiovascular disease. Increased health care utilization was not associated with severity of airflow obstruction in the current study consistent with Simon-Tuval et al.'s (2011) findings. Similarly, Shaya, El Khoury, Samant, & Scharf (2006) and Lin, Shaya, & Scharf (2010) reported 1.33 times greater healthcare resources use and 1.8 times greater adjusted average number of inpatient claims in COPD patients compared to non-COPD controls. In addition, Mapel et al. (2000) found that healthcare utilization among COPD patients in New Mexico was almost double of age and gender matched controls. However, analyses in the present research did not indicate that there was a significant difference in HCA between COPD patients with and without co-morbidity. The lack of association between co-morbidity and HCA suggested that greater HCA in patients with COPD in the present study was not due to co-existing disease. While the questionnaire on HCA administered to patients was COPD-specific, co-morbidities could still have contributed to exacerbations or complications with their COPD in an indirect way. For example, cardiac disease could have increased the likelihood of dyspnoea or musculoskeletal conditions through restricting exercise or participation in PR due to limited mobility. However, analyses did not show any significant associations between co-morbidities and HCA.

- The Quality and Outcomes Framework (QOF)

The lack of a relationship between higher deprivation and poorer HCA could be due to the Quality and Outcomes Framework (QOF), which is a voluntary pay-for-performance scheme introduced in 2004 in the UK (National Institute for Health and Clinical Excellence, 2012). The QOF provides incentives for GP practices through rewarding

them for quality patient care. Practices score points according to their level of achievement in a number of groups of indicators depending on the disease, such as coronary heart disease or COPD, following NICE guidelines. In the case of COPD, GP practices receive points for performing regular spirometry on their patients. This could partly have contributed to increased rates of regular spirometry in lower SES groups. It would also be consistent with Gillam, Siriwardena, & Steel's (2012) review who found that differences in QoF performance between deprived areas and more affluent areas were decreasing. However, the QOF would not be able to explain why more deprived participants were more likely to receive more frequent spirometry compared to higher SES patients. This suggested that other factors might have contributed to this relationship such as patients' or doctors' perceptions, attitudes and cognitions.

The lack of an association between higher deprivation and poorer HCA could be an indication of a possible link between the QOF and a possible decrease in inequalities in processes of care between highly deprived and more affluent areas (Doran, 2008). Doran's findings (2008) indicated that the gap in median achievement between GP practices located in the most deprived and the least deprived quintiles decreased from 4% to 0.8% between 2004 and 2007. In addition, although there was significant improvement (up to 38%) in quality of care for all indicators in the timeframe between 2001 and 2007, quality reached a plateau after the first 3 years (Doran, et al., 2011). Higher rates of regular spirometry in lower SES could be a reflection of this improvement since more deprived patients were more likely to have received better health care services. However, there might not have been a difference in this relationship to begin with. The systematic review (see Chapter Four) which included studies from the last two decades, showed that there was no quality evidence to support the link between poor HCA and lower SES in COPD patients. The increased spirometry rate might not have been an improvement but could have been the baseline from the start.

Evidence from the National COPD Audit showed that 74% of admitted patients contacted their general practice in the month before hospitalisation and 31% contacted their GP three or more times in that month (National COPD Audit, 2008) indicating that access to GPs was not significantly impaired. Facilitated access to GP consultation through rapid access to primary care during a COPD exacerbation could explain the association between good access to GP consultations and reduced risk of hospitalisation (Calderón-Larrañaga, et al., 2011). Associations between the COPD-related quality indicators examined and reduced admission rates were found only for

influenza immunisation. This facilitated access might have increased the likelihood of offering referrals and other needed health care services to deprived COPD patients. The QOF could have contributed to this through promoting health care access for all COPD patients. Access to GPs could have been facilitated through implementation of certain QOF indicators such as assessment of breathlessness (MRC dyspnoea scale), lung function (spirometry), inhaler technique and influenza immunisations (Indicators for Quality Improvement, 2010). However, the systematic review (see Chapter Four) showed that more deprived patients had better access to health care services for certain outcomes. This would weaken the argument for the QOF because some of these studies were conducted before its introduction or in countries where the QOF does not exist. The small number of studies included in the review was not sufficient to draw stronger conclusions and thus caution is required when attempting to interpret findings.

The QOF "hypothesis" could also associated with higher smoking cessation referrals. Smoking cessation referrals was one of the five indicators that showed the highest increase (Doran et al., 2011). Smoking status recording had a low baseline which was attributed to two possible reasons. First, practices might not have asked most of their patients whether they smoked or not before the incentives were introduced. Second, had they asked, they might not have kept records of smoking status. GPs might have been aware of patients' smoking status but since this was not being recorded, they might not have offered them smoking cessation referrals. The QOF could have increased the likelihood that doctors would act on their patients' smoking status, thus contributing to higher rates of smoking cessation referrals in patients with COPD.

- Conclusion

The evidence does not appear to support a relationship between low SES and lower HCA in patients with COPD. Higher deprivation was associated with better access to health care services in some cases, consistent with existing literature. This, combined with the robustness of the design (method of recruitment, comprehensive assessment of SES and HCA measures, sufficient sample size, representation of SES levels and disease severity stages) strengthen the assumption that more deprived COPD patients were as likely to get equal or, in certain cases, greater HCA compared to more affluent COPD patients. This could be attributed to a number of additional factors such as the

nature of health care systems, the presence of co-morbidities and other elements discussed above.

b. Present findings on SES and HCA and comparison to existing literature

A widespread assumption was that higher deprivation was related to poorer HCA (Ben-Shlomo & Chaturvedi, 1995; Watts, 1993; Tudor Hart, 1971). This assumption did not appear to apply for COPD patients. A limited number of studies investigated the relationship between SES and HCA in COPD, as observed in the systematic review (see Chapter Four). Where evidence for the association between SES and HCA exists, it does not show a clear direction. Despite the fact that this evidence was weak and not as rigorously conducted as the present study, it also showed that higher deprivation was related to greater health care access. For example, access to GPs and hospital services favoured lower SES groups (Van Doorslaer, Masseria, & Koolman, 2006; van der Heyden et al., 2003; Sutton et al., 2002; Masseria & Giannoni, 2010). In contrast, access to specialist services favoured higher SES groups (Masseria & Giannoni, 2010; Finkelstein, 2001; Dunlop et al., 2000; Hurley & Grignon, 2006). No evidence was found for the HCA outcomes measured in the current study. This could be due to COPD being mainly treated by GPs in the UK. Specialist referrals are not routinely offered and, when they are, patients are usually discharged back to their GPs after specialist assessment. This could be indicative of high levels of expertise and ability of GPs in treating these patients and therefore decrease the need for specialist treatment, irrespective of SES (Regidor et al., 2008). Finally, lack of support for the HCA measures in this study could also be attributed to the more robust design employed. The variety of HCA and SES measures, the large sample size and the method of participant recruitment which ensured high representativeness could have resulted in stronger evidence contradicting earlier research.

Present findings contradicted past research on hospital admissions. Admissions were with low SES in terms of educational attainment and income level (Agabiti, et al., 2009; Miravitlles et al., 2006; Prescott et al., 1999). These studies did not adjust for severity of disease in their analyses. More severe disease related to lower SES could have influenced findings. In addition, educational level was defined as low, medium and high based on completion or not of primary education or more than primary education. This could have resulted in significant differences due to the vague classification. For

example, more than primary education could mean either secondary education completed or not or higher education which does not reflect accurate levels.

Similar evidence linking lower SES to impaired access to primary care services was provided by Begley et al. (1994). However, Begley, et al. (1994) used avoidable hospital admission rates as an indicator of impaired primary care access and included a variety of different health conditions such as diabetes, urinary tract infections, asthma, epilepsy and hypertension. In addition, Begley et al. (1994) did not adjust for disease severity. Moreover, the study was conducted in the USA where lack of health insurance might have contributed to poorer primary care access and higher rates of hospital admissions.

Current findings did not indicate lower health care access in lower SES groups when controlling for severity. Health care access measures referred to both primary care services received at the GP practice and hospital admissions. There was no difference between low and high SES and HCA and where a relationship was found, access was greater for the more deprived groups. Hospital admission was not associated with lower SES. Based on the lack of a relationship between SES and HCA but considering the vast literature on health inequalities, it is tempting to speculate that health inequalities might be greater before the emergence of an illness but significantly reduced thereafter possibly due to the nature of the NHS or the availability of other services to patients.

9.2.2 Were illness perceptions associated with SES and HCA?

Income and educational level showed a number of significant associations with certain illness perceptions. Higher educational and income level were both associated with stronger perceptions of personal and treatment control. In addition, higher income level was related to weaker perceptions of identity, consequences, timeline cyclical and emotional representations. These associations suggested that people who were financially better off and more educated attributed fewer symptoms to their COPD, viewed its impact on their daily lives as less severe and considered it more stable. They also felt they had greater control over the illness and that their treatment was effective in managing their COPD successfully. It is not possible to claim that people had more positive perceptions of their illness because they were more affluent or more educated. People could have attained higher income level because they perceived

their illness to be less severe and under control. Thus, they might have continued working and engaging in a variety of activities that could have promoted their social and financial status. Whereas, educational attainment would probably have been completed by the age (i.e. over the age of 40 usually) when COPD is usually diagnosed or when symptoms deteriorate. The remaining aspects of SES measures (IMD scores and quintiles and occupational class) were not significantly associated with illness perceptions.

Previous research investigated predictors of illness perceptions in coronary heart disease (CHD) patients and found a significant relationship between illness perceptions and personal and social resources (Aalto et al., 2006). People who perceived themselves to be more competent were less likely to attribute symptoms to their CHD, felt more in control of the illness, perceived less severe impact of the disease and attributed fewer symptoms to CHD. Aalto et al. (2006) used a stress-appraisal framework which postulated that people with stronger beliefs in their ability to deal with life events were more likely to adopt effective ways of coping with their illness and its challenges. This resulted in evaluating the consequences of CHD as less severe and threatening and reinforced their perceptions of control over the illness.

In the present study, COPD patients who had higher weekly income and higher educational attainment were more likely to report higher perceived levels of personal and treatment control, weaker identity beliefs and perceived consequences as well as weaker perceptions of timeline cyclical and more stable emotional representations. The stress-appraisal framework could be used to explain these findings. More affluent and educated patients may have had stronger belief in their abilities to cope with life due to more available resources. This belief might have been associated with higher likelihood of these patients adopting effective ways of coping with their illness and its challenges.

All HCA measures (smoking cessation and specialist referrals, pulmonary rehabilitation awareness, referrals, attendance and completion, regular spirometry, treatment appropriateness and hospital admission) were significantly associated with illness perceptions except for regular spirometry. Participants who had stronger identity beliefs (i.e. more symptoms attributed to COPD), stronger perceptions of consequences (i.e. the magnitude of the impact of COPD on their daily life) and stronger perceptions of timeline (i.e. COPD being chronic) were more likely to have been offered referrals to specialists, PR programmes and given appropriate treatment for their condition. PR awareness and referral were also more likely in more severely affected COPD patients

(in terms of FEV_1% predicted). In addition, higher hospitalization rates were related to stronger timeline cyclical beliefs. This relationship could be due to the very nature of COPD which is characterized by periods of symptom stability and exacerbations possibly leading to more frequent hospitalizations. On the other hand, frequently admitted patients might be more likely to have stronger timeline cyclical perceptions due to alternation between remissions and exacerbations of their COPD. These associations were unaffected by disease severity suggesting that hospital admission was not related to severity of patients' COPD.

a. Possible explanations for the relationship between illness perceptions and HCA

The significant relationship between illness perceptions and HCA in COPD could be explained in different ways. These will be discussed in the following sections.

- Illness perceptions and health care services providers

COPD patients' more negative illness perceptions could have influenced doctors' clinical management. These patients could have provided their physician with more information about their history and symptoms due to higher worry or preoccupation with their illness. This could have increased physicians' openness for the delivery of quality care (Farr, 2000) as long as the doctor allowed the patient to be expressive about symptoms, expectations and feelings and patients' and doctors' perceptions being congruent (Kleinman, 1978).

Alternatively, providing patients with the responsibility to manage their COPD through available options could increase perceptions of the illness placing more demands on everyday life. This could then lead to more negative illness perceptions because of illness uncontrollability beliefs. PR completion was associated with weaker perceptions of consequences and stronger illness coherence which could be indicative of the positive effects of PR not only on patients' physical and mental status but also on patients' illness perceptions (Fischer et al., 2010). The opposite could also be true. Patients who perceived the impact of COPD on their everyday life to be less significant and who had a good understanding of their illness were more likely to successfully

complete the PR course in Fischer et al.'s (2010) study. Again causal relationships cannot be inferred due to the nature of the study design.

- Illness perceptions, behaviour and health care seeking

The role of illness perceptions could influence HCA through risk perception which can affect behaviour such as seeking health care (Baumann, Cameron, Zimmerman, & Leventhal, 1989; Cameron et al., 1993). Patients' experience and the intensity of new, worrisome symptoms and their interpretation were more likely to have increased the likelihood of health care-seeking. Identification of symptoms or sensations that are not consistent with usual physical sensations set the ground for health care-seeking (Cameron, et al., 1993). The interpretation of these "inconsistent" symptoms depends on their match with an underlying abstraction of symptoms associated with a particular illness. For example, the controls in Cameron et al.'s (1993) study who did not seek medical care were less likely to have viewed their symptoms as disruptive, less likely to have evaluated them as "inconsistent", and less likely to have attributed their symptoms to a specific illness (i.e., the "inconsistent" symptoms had not exceeded the threshold in order to be associated with illness-specific concepts). Although these examples referred to hypertension, other conditions such as asthma follow a similar pattern. The majority of patients considered asthma to be a chronic condition, however, over half of them believed they had asthma only when they experienced symptoms (Halm, Mora, & Leventhal, 2006). The episodic nature of asthma characterised by attacks and remission reinforced cyclical representation which was associated with less frequent use of preventer medication and routine GP visits as well as use of peak flow meters to evaluate lung function (Halm et al., 2006). In contrast, COPD is a slowly progressing disease. The chronic nature of COPD and its gradually deteriorating associated symptoms such as cough and breathlessness might have lead to the development of stronger illness perceptions.

But would the way patients perceived their illness guide them to also act in a certain way? While the Common Sense Model (CSM), in which illness perceptions are the key construct (Leventhal et al., 2003; Leventhal, Safer, & Panagis, 1983), provides the framework to combine elements involved in connecting physical experiences to underlying constructs to create and activate illness perceptions, it cannot be used on its own to predict how an individual will behave. People vary in how they perceive their

illness due to the influence of external variables that may affect behaviour such as socio-economic factors which could be linked to different beliefs and perceptions even within an illness-specific patient population.

Illness perceptions are associated with specific procedures following the “if-then” rules but not coping strategies because coping strategies may moderate specific action (Leventhal, Leventhal, & Breland, 2011). For instance, patients with colon or breast cancer may choose to select surgery over radiation therapy because they may consider surgery a way of removing the tumour. However, whether these patients make that therapy choice or how fast they make it can be influenced by coping strategies such as avoidance versus problem-focused coping. Strategies for self-regulation incorporate and influence both illness and treatment representations. Based on the symptoms people experience and the way they interpret them, they might choose a procedure from a set of potential treatment or lifestyle behaviours to remove the inconsistent symptoms within a given time frame. However, in order for an individual to enact the intended behaviour, the behaviour needs to be placed in the appropriate context that would encourage it to occur. This framework could explain the associations between illness perceptions and health care access and highlight the possible influence of doctor-patient interaction. COPD patients may have had stronger illness perceptions which made them more likely to be aware of and eager to attend PR courses but these were dependent on cues provided by the physician as well. These cues would facilitate the conversion of their intentions into actions such as being offered referrals for smoking cessation or PR which would suit their needs and circumstances. Therefore, the influence of the health professional would need to be taken into consideration when attempting to draw conclusions or make speculations regarding underlying pathways.

- Illness perceptions, PR and smoking cessation

Pulmonary rehabilitation was not associated with socio-economic factors. Attendance and completion rates at PR were previously reported to be low with approximately 1.5% of COPD patients accessing PR annually (Yohannes & Connolly, 2004). A more recent study by Hogg et al. (2012) reported that 73% of the COPD patients who were referred for pulmonary rehabilitation attended assessment, 59% started the programme and only 40% completed it. Low completion rates were significantly associated with

depression as well as deprivation and greater disease severity. However, the authors noted that these variables could only account for 10% of the variance in completion rates and suggested that further factors might be implicated.

Keating, Lee, & Holland (2011) and Whitehead et al. (1992) found that reasons for non-attendance included lack of means of transportation and no perceived benefit associated with attending. Non-completion was related to depression, smoking and lower physical strength. Disease markers such as lung function or dyspnoea were not significantly associated with attendance or completion of PR. Keating et al. (2011) drew attention to the fact that the factors mentioned above accounted for less than 50% of the variance and suggested that further factors such as personal experiences might be associated with PR completion. Similarly, Fischer et al. (2009) found that failure to complete or not attend PR was due to medical or practical reasons such as time constraints and dissatisfaction with the health care system. Current smoking and depression were also related to lower completion rates in Fischer et al. (2009).

What was the role of illness perceptions in PR completion in the present study? COPD patients who completed PR had stronger illness coherence and weaker consequences. These patients might have completed their programme successfully because they had a better understanding of their COPD and felt that the impact of their illness on their life was not very severe. On the other hand, as a result of completing PR, they might have acquired a better understanding of the illness and have realized that the consequences of their illness were not significant. But, causal relationships cannot be inferred due to the cross-sectional design of the study. In addition, patients who were aware of PR tended to have stronger identity, timeline, consequence perceptions as well as stronger emotional representations but weaker treatment control beliefs. This suggested that these patients felt their treatment was not sufficient in controlling their illness but they also felt their COPD was chronic, associated with more symptoms, and had more severe impact on their daily lives and emotional functioning. These perceptions could have made these patients more proactive in seeking information on further services available to improve their health status.

9.2.3 Were self-efficacy and social capital associated with HCA?

Self-efficacy was not associated with HCA possibly because general instead of COPD-specific self-efficacy was examined. General self-efficacy might not be as relevant as

the latter in the health care context because it refers to an individual's belief in their ability to cope with any demand and event that may arise in their lives.

Overall, social capital was not significantly associated with HCA. Two significant relationships between HCA and SC were found: smoking cessation referral and over-treatment. People who felt less appreciated by society were more likely to have been given smoking cessation referrals. On the other hand, people with more family and friend connections were more likely to have been over-treated (i.e. prescribed respiratory drugs appropriate for more severe disease). It would be tempting to interpret over-treatment as a sign of doctors' eagerness to relieve the patient from their symptoms and improve their QoL - possibly indicating greater HCA. However, Lucas, Smeenk, Smeele, & van Schayck (2008) found that GPs' lack of sufficient awareness of the need for proper diagnostic testing and diagnostic short-comings was associated with increased unnecessary prescribing of inhaled corticosteroids (ICS) in patients with asthma and COPD. Overprescribing was related to higher costs and possible side effects. From this perspective, over-treatment could be considered as evidence of worse health care. Brunner et al. (1999) reported over-prescription of medication in 54.9% of COPD patients. Over-prescription is important to consider due to not only unnecessary expense but also because due to increasing the risk for adverse drug effects and poor adherence (Franssen, Spruit, & Wouters, 2011; Mackenbach, et al., 1997).

Over-treatment was associated with both stronger emotional representations and more family and friend connections. Patients could have been prescribed unnecessary respiratory medication because of their preference for prescriptions or because of particular expectations (Virji & Britten, 1991). These could have been influenced by stronger emotional perceptions of their COPD reinforced by their family and friends' encouragement (Virji & Britten, 1991).

9.2.4 Was SES associated with QoL?

Higher weekly household income level was significantly related to better QoL but the remaining SES measures i.e. IMD, educational level and occupational class were not. Less deprived people in terms of income level were more likely to report lower levels of dyspnoea, fatigue and lower risk of depression, better emotional function and greater mastery unaffected by disease severity. However, the strength of these associations

was moderate ranging from 0.22 – 0.25. The fact that only income level was associated with QoL might be an indication that it could be reflecting current SES more effectively compared to educational attainment and occupational status in this particular participant sample where the mean age was 69 years (Braveman et al., 2005). Present findings differ from those of Miravitlles, Naberan, Cantoni, & Azpeitia (2011) who found that lower educational and occupational level were significantly associated with poorer HRQoL in COPD patients. However, the QoL measure used by Miravitlles et al. (2011) was the EuroQoL-5 (Brooks, 2003) which is not COPD-specific and therefore might not have been able to capture the particulars of this condition. Moreover, educational level was classified into "low" (referring to uneducated/unfinished primary school), "medium" (finished primary school) and "high" (finished secondary school and university degree) which could have affected their results. The present study categorised educational level as low (secondary or less) and high (post secondary). Moreover, Miravitlles et al. (2011) controlled for disease severity by using the COPD severity score (COPDSS) which is a valid survey-based measure of disease-specific severity (Eisner et al., 2005; 2010) but does not require lung function assessment which is the main measure of severity of COPD (GOLD, 2011). Last but not least, Miravitlles et al. (2011) did find an association between lower educational attainment and poorer QoL in COPD patients but effect sizes were very small and their sample size was very large. Thus, these results may not have been of clinical significance.

Analyses in the present study regarding QoL showed that COPD patients' physical and mental status was slightly better compared to previous findings (Saydah & Lochner, 2010; Dransfield et al., 2011; Withers et al., 1999; von Leupoldt et al., 2011). This was not surprising since greater use of health care services was observed. However, it is not known whether this difference in QoL between the participant samples is statistically significant because further analyses of all the data would be required to establish that. If the difference was not statistically significant, it would be less likely that greater health care access was associated with improved QoL in COPD patients. In addition, it raises the question whether further factors linked to illness perceptions might have confounded the beneficial effect of improved HCA such as advanced age or existing co-morbidities. It could be possible that despite better access to health care services, patients' QoL was not influenced due to these variables.

a. How could findings regarding SES and QoL in COPD be explained?

As discussed above, income level was significantly related to QoL in COPD. However, the remaining SES measures (IMD, educational levels and occupational class) were not. Proposed reasons for this inconsistency are discussed below.

The QoL measures used in the present study which assessed domains such as mastery, fatigue or breathlessness might not have been related to IMD but to more specific SES indicators, for example income level. Secondly, IMD is an area-based rather than an individual-based indicator for SES and may not reflect the extent of deprivation of the participant sample. The IMD includes seven dimensions to measure deprivation at an area level (deprivation in income, employment, health and disability, education, crime, barriers to housing and services and in the living environment). These dimensions carry varying weights depending on the perception of their importance. For example in the IMD 2010, the highest weights are carried by income, employment, health and disability and education deprivation. Furthermore, because of this weighted cumulative model employed for the different domains of deprivation, lack of deprivation in one domain could cancel out deprivation in another domain. For example, low levels of income deprivation could cancel out high levels of health and disability deprivation. Patients of higher income would have the financial resources to visit a doctor privately compensating for the limited health care services in their area. Thus, income level appears to be the measure that would probably more accurately reflect patients' financial circumstances and potential ability to counterbalance area-level deprivation. This could be true especially when considering the diversity of South-East London. The fact that the other measures examined this thesis such as self-efficacy, illness perceptions and social capital did not show any significant associations with IMD, suggested that a true relationship between SES in terms of IMD and QoL was not being concealed.

In addition, income level would reflect current SES on an individual level such as the receipt of a private pension and might therefore be more likely to show associations with QoL. Higher income could provide an individual with higher buying power in order to secure certain lifestyle patterns such as better nutrition, better housing, and higher exercise uptake. Poorer lifestyle conditions were associated with worse QoL in COPD (Franks & Fiscella, 2002; Winkleby et al., 2007; Di Pede et al., 1991; Arne et al., 2009). However, behaviour is not the only predictor of QoL. Other predictors of QoL in COPD patients that have been reported include the extent of perceived tension-anxiety,

exercise performance, FEV_1, and neuropsychological status (Prigatano, 1984). In addition, the lack of significant associations between occupational class and QoL indicated that it was probably not social status derived from occupational class that was associated with people's well-being. It is less likely that higher income level would be associated with QoL through providing higher prestige particularly when the vast majority of the sample was retired.

Higher educational could exert an influence over QoL. However, even if a more educated person knows that exercise and good diet is essential for them to be healthier, this does not mean they would adopt this lifestyle for a variety of reasons. These reasons include factors that might interfere between the intention to engage in a certain behaviour and acting on it, such as planning, maintenance self-efficacy, and action control (Clegg, et al., 2009; Sniehotta et al., 2005) or lacking monetary resources. This could potentially explain why income level was associated with QoL and educational attainment was not. For example, more educated COPD patients who were aware of the value and necessity of consuming fresh fruit and vegetables or joining an exercise programme, would be less likely to do so if they would not be able to afford it. In addition, educational attainment could influence an individual's QoL through other ways such as greater knowledge and awareness of their condition and ways of managing it successfully. Higher education could be associated with increased awareness of availability of health care services and ways of accessing them more effectively. This could be achieved perhaps through influencing doctor-patient interaction in a beneficial way, for instance, through showing awareness and understanding of the treatment options or lifestyle changes that need to be adopted.

9.2.5 Were illness perceptions associated with QoL?

Most illness perceptions showed significant associations with QoL in patients with COPD. Stronger perceptions of identity, consequences, timeline cyclical, illness coherence and emotional representations as well as weaker perceptions of personal and treatment control were associated with poorer QoL. These relationships were unaffected by disease severity suggesting that poorer QoL was not an effect of more severe COPD. Findings are consistent with previous research. Identity has consistently been reported to be related to physical and psychological outcomes in COPD. For example, Scharloo et al. (1998) found associations between strong identity beliefs and physical, role and social functioning. In other words, patients who attributed more of

their symptoms to COPD were more likely to experience poorer physical and mental status compared to patients who did not attribute so many symptoms to their illness. The authors also observed associations with further dimensions namely timeline, consequences and control (Scharloo et al., 1998, 2000, 2007; Kaptein et al., 2008; Howard et al., 2009). Patients who believed that their illness was chronic, perceived their illness to have a serious impact on their lives and felt they had less control over managing their COPD had poorer QoL outcomes. In the present study, findings were identical with the exception of chronic timeline. Timeline cyclical was associated with poorer QoL. This difference could be attributed to the specific characteristics of the population examined. For example, they might have had more frequent exacerbations compared to the other patients groups. This might have been linked to perceptions of a more cyclical nature of their COPD while remissions of the disease might have been linked to perceptions of non-chronicity. Negative consequences are related to higher levels of depression and anxiety in a number of conditions such as rheumatoid arthritis (Groarke et al., 2005; Murphy, Dickens, Creed, & Bernstein, 1999; Schiaffino, Shawaryn, & Blum, 1998), irritable bowel syndrome (Rutter & Rutter, 2002), breast cancer (McCorry, et al., 2012), cardiac patients (Le Grande et al., 2012) and diabetes (Skinner et al., 2010). The strength of the correlations with depression and anxiety was weak for most illness perceptions in the aforementioned studies but strong for identity, consequences and emotional representations. It cannot be established whether poorer QoL influenced patients' illness perceptions or whether their illness perceptions led to poorer QoL. It could be that the experience of more symptoms and a more severe impact of COPD on daily life led to more negative illness perceptions about their illness. Alternatively, poorer QoL could have resulted from maladaptive illness perceptions such as perceptions of lack of control or symptoms associated with COPD preventing patients from engaging in various positive health behaviours such as exercise, diet, medication adherence or stopping smoking, which would, in turn, have an effect on their QoL (Chen, Clark, & Talcott, 2009; Harvey & Lawson, 2009).

a. Present findings on SES, illness perceptions and QoL in COPD and comparison to past research

Present findings are consistent with previous studies that reported a link between illness perceptions and QoL in chronic illness (Covic, Seica, Gusbeth-Tatomir, Gavrilovici, & Goldsmith, 2004; Kaptein et al., 2011; Hagger and Orbell, 2003). Kaptein

et al. (2008) reviewed the evidence for illness perceptions in patients with COPD which demonstrated similar patterns to other diseases. The results of the review indicated that a variety of outcomes are related to illness perceptions in COPD such as physical and emotional functioning, for example depression, anxiety, the degree of disability and quality of life. Poorer outcomes were associated with stronger perceptions of identity, lower perceived personal control, and stronger emotional representations while better outcomes were associated with a higher sense of control and self-efficacy and more stable emotional representations.

Quality of life was significantly impaired in patients with COPD in comparison to populations without health problems echoing previous literature (Ketelaars et al., 1996; Okubadejo et al., 1996; Ferrer et al., 1997). Similar findings were observed in Canada (Ross et al., 2011) where a social gradient in quality of life according to both income and education was observed. The higher people's educational attainment was the higher their income and the better their QoL. Gómez-Olivé, Thorogood, Clark, Kahn, & Tollman (2010) found similar results in rural South Africa. Low education, household income and unemployment were associated with poorer QoL. This would suggest that the reasons for poorer QoL in COPD might be found in factors other than HCA such as the nature of the disease.

- Conclusion

There appears to be substantial support for the association between illness perceptions and QoL and health outcome. Although a large number of these studies were cross-sectional, some employed a longitudinal design. Kohlmann, Rimington, & Weinman (2012), for example, found that the majority of patients in their study retained similar patterns of illness perceptions before their valve replacement one year post-surgery. These patterns significantly predicted patients' health status. Still, a smaller group of patients showed changes in their illness perceptions in the absence of any interventions. Kohlmann et al. (2012) suggested that these changes were due to patients' personal experiences that occurred during this time and not to changes in their medical status (Weinman & Petrie, 1997). Another longitudinal study showed that illness perceptions such as higher perceived treatment control predicted survival in haemodialysis patients independent of depression, comorbidity and age (Chilcot, Wellsted, & Farrington, 2011). Treatment control perceptions were not related to the

adequacy of dialysis suggesting that these perceptions were probably mediated by health care behaviours that were not following the treatment regimen (Chilcot et al., 2011). More longitudinal studies are needed to increase our understanding of how illness perceptions develop or change over time and how they could affect health outcomes.

9.2.6 Were self-efficacy and social capital associated with QoL?

Higher self-efficacy was associated with better QoL consistent with previous literature (Knittle et al., 2011; Mystakidou et al., 2012). Causal relationships cannot be inferred and therefore the direction of the association is not clear. Patients who believed they could achieve their goals such as physical activity targets (Woodgate & Brawley, 2008; Ashford et al., 2010), smoking cessation (Schnoll, et al., 2011) or dietary change (Pinto, Clark, Cruess, Szymanski, & Pera, 2012) were more likely to experience better QoL. If their QoL was better, they would feel more confident in their abilities to achieve desired outcomes and their self-efficacy could be higher (Pinto et al., 2012). In his study, general self-efficacy was examined rather than disease- or behaviour-specific self-efficacy. General self-efficacy describes a person's overall belief in their ability to deal with life events not restricted to their illness or specific behaviours. Therefore, all aspects of patients' daily life would be affected. The relationship between specific (COPD) self-efficacy and quality of life in COPD has previously been supported (McCathie, Spence, & Tate, 2002). This association persisted even when adjusting for disease severity and duration as well as socio-economic status. Higher levels of self-efficacy were related to decreased impact of COPD on patients' psychosocial functioning, increased physical activity and quality of life (Bentsen et al, 2010). Lower levels of self-efficacy were related to poorer self-management of disease in COPD patients (Warwick et al., 2010) as well as perceived difficulty in breathing (Jee, 2011). Similar associations were reported in terms of survival, engagement in physical activity (Kaplan et al., 1994; Soicher et al., 2012) and functional performance (Siela, 2003). Current analyses supported the relationship between self-efficacy and QoL in patients with COPD. The higher patients' belief in their abilities to achieve their goals and objectives, the more likely they were to experience better QoL. Self-efficacy was significantly associated with all domains of QoL i.e. perceived fatigue, better emotional function, greater mastery and lower risk of depression and anxiety. These results confirm previous reports that highlighted the importance of self-efficacy in relation to

QoL. However, self-efficacy and QoL could have been affected by a third factor such as depression. Patients with higher levels of depression could have lower levels of self-efficacy and poorer QoL. The interrelationship between depression and self-efficacy and QoL could influence coping strategies or disease management negatively (Cleland, Lee, & Hall, 2007; McCathie, Spence, & Tate, 2002).

Higher levels of social capital were related to poorer QoL in all domains except for mastery when adjusting for disease severity. For example, higher participation in local community events was associated with greater fatigue and dyspnoea, poorer emotional function and higher risk of depression and anxiety. This could have been due to the strain of active social involvement on patients with COPD which manifesting as increased fatigue and dyspnoea and poorer emotional functioning. In contrast, higher levels of social proactivity, more family and friend as well as work connections and greater value of life were associated with lower risk of depression. Findings indicate that different elements of social capital might be associated in different ways with QoL in patients with COPD.

a. Present findings on self-efficacy and social capital and QoL in COPD and comparison to past research

Present findings on self-efficacy and social capital in relation to QoL are consistent with previous research. Grodner et al. (1996) found that social support and self-efficacy as well as dyspnoea and exercise performance were positively associated in patients with COPD after completing pulmonary rehabilitation. However, social support was only measured at baseline and therefore the direction of the relationships could not be established. When disease severity was adjusted for, the relationships became marginally significant. Lower levels of social capital have previously been shown to be associated with poorer quality of life (Kawachi & Berkman, 2001) through a number of pathways such as diffusion of knowledge about health-related actions (e.g. smoking cessation), social control over health behaviours through facilitating access to local services and facilities promoting healthy living (e.g. parks and gyms) (Rogers, 2003) and health care services (Kawachi and Kennedy, 1999), or through psychosocial processes such as provision of social support and respect (Kawachi and Berkman, 2002; Wilkinson, 2002). Participants who were still in employment and had more connections at their workplace experienced lower risk of depression possibly through

greater availability of social support through colleagues. Interpretation of results warrants caution because the number of participants who were still working was very small. The only social capital dimension that was not associated with quality of life was tolerance of diversity. The impact of multiculturalism of the area of residence and living among people of different lifestyles did not appear to have any effect on patients' QoL. This could be due to patients' limited mobility restricting their social activities and engagement. Alternatively, diversity might not affect QoL in patients with COPD.

9.2.7 Psychosocial variables as mediators in the relationship between SES and HCA and QoL

SES in terms of IMD scores and quintiles was significantly associated with HCA with respect to smoking cessation referral. SES in terms of educational level was significantly associated with HCA with respect to regular spirometry. However, these associations were weak and were not significantly mediated by illness perceptions, self-efficacy or social capital. This suggested that other factors could be mediating the effect of IMD variables on smoking cessation referral and regular spirometry. HCA data were based on patient self-report and thus recall of referrals and use of other health care services might not have been accurate.

a. Did psychosocial variables (IPs, GSE, SC) mediate the relationship between SES and QoL?

A number of illness perceptions significantly mediated the relationship between income and all domains of QoL (dyspnoea, fatigue, mastery, emotional function, and depression). For instance, patients with lower income were more likely to associate more symptoms with their COPD, perceive a more severe impact of COPD on their lives and perceive poorer emotional representations. These illness perceptions were associated with higher levels of dyspnoea, fatigue and higher risk of depression. Self-efficacy mediated the impact of income in most domains (mastery, emotional function and depression). For example, patients who had lower income were more likely to perceive greater self-efficacy which was associated with greater levels of mastery, better emotional function and lower risk of depression. Social capital elements (feelings of trust and safety and value of life) only mediated the effects of income on depression

and the relationship between income and dyspnoea. Patients who had lower income were more likely to have lower feelings of trust and safety as well as weaker value of life beliefs. These were associated with higher levels of dyspnoea and higher risk of depression. Findings suggested that the relationships between income level and QoL in COPD were mediated by illness perceptions to a statistically significant extent and less by self-efficacy and social capital elements. However, the amount of variance explained by these mediators was small ranging between 4 and 9%. The size of the observed R-squared values was smaller than expected for these relationships. While a bigger sample size would have increased power to show the mediating effect of illness perceptions, this would not have altered the present conclusions because the effect sizes were very small. A larger sample size would have reduced the confidence intervals of the effect sizes and may have made some of the p values significant but it would be unlikely to increase the effect sizes. Further factors not examined in this research could be considered as possible mediators in the relationship between income level and QoL in COPD patients. Factors affecting QoL in COPD reported in previous studies include pessimism, hopelessness, hostility or anger.

b. The possible role of negative emotions and affect in the relationship between SES and QoL

The relationship between SES and QOL could be understood in the context of low-SES environments. Low SES could contribute to exacerbation of emotions and attitudes, and these may have deleterious effects on health. It was suggested that more deprived people are more reactive to stress compared to their more affluent counterparts due to limited availability of personal and interpersonal resources to cope with stressful events in life and which, in turn, would be linked to increased stress levels (Gallo and Matthews, 2003). Negative emotions and cognitions can have an impact on health through behavioural (e.g. medication adherence, lifestyle, smoking) (Smith, 1992; Williams, O'Connor, Grubb, & O'Carroll, 2011) and physiological pathways (e.g. dysregulation of the hypothalamic-pituitary-adrenocortical (HPA) axis, increased blood pressure and inflammatory processes) (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002). In addition, more deprived people were more pessimistic in comparison to more affluent people and were more likely to anticipate bad future events. In contrast, being optimistic and anticipating good events in the future was not linked to SES (Robb,

Simon, & Wardle, 2009). Further variables that might be considered as possible mediators in the relationship between SES and QoL in COPD are discussed below.

Negative cognitions and affective states could be inversely associated with SES (Gallo & Matthews, 2003). Gallo and Matthews (2003) proposed a model of psychosocial pathways in the relationship between SES, cognitive-emotional variables and health status. According to this model, lower SES is associated with negative emotions and attitudes through the experience of frequent and intense harmful situations and chronic stress (McLeod & Kessler, 1990; Murrell & Norris, 1991; Stansfeld et al., 1998). Lower SES groups are more likely to interpret ambiguous social events in a more negative way due to cognitive bias, i.e. the tendency to appraise various ambiguous situations consistently in a negative way (Chen & Matthews, 2001). The more significant impact of stress on low-SES people could be explained by fewer resources available in terms of tangible, interpersonal, and intrapersonal support to help them deal with stressful events in comparison to higher SES individuals. Responses to stressful stimuli at the psychological, behavioural, and biological levels have harmful effect on health in the long-term (Adler & Snibbe, 2003). For instance, a threatening situation might increase feelings of distrust which could lead to heightened physiological arousal and undermine social trust (Chen & Matthews, 2001). Biological factors should therefore be considered as possible mediators in the relationship between SES and QoL in addition to the psychosocial variables mentioned above. Increased physical risk and decreased well-being might not only be influenced by greater environmental exposure to stressors, but also by the way people psychologically react to such stimuli.

Hopelessness is defined as “negative expectations about the occurrence of highly valued outcomes and feelings of helplessness about changing the likelihood of occurrence of these outcomes” (Alloy, Abramson, Metalsky, & Hartlage, 2011). Hopelessness has been associated with a number of health outcomes such as heart attacks and cardiac death, and has been implicated in the relationship between SES and health (Fiscella & Franks, 1997). However, hopelessness is associated with increased proneness to disease. This does not equate to hopelessness necessarily influencing health status after the emergence of an illness in the same way. Hostility and anger predicted mortality and morbidity, and in some patient populations they mediated the relationship between SES and cardiovascular functioning (Gump, Matthews, & Räikkönen, 1999). Optimism and pessimism were predictors of recovery from coronary bypass surgery and onset of AIDS in individuals who had tested HIV-positive. In COPD, patients who experienced negative emotions such as anger,

hopelessness or helplessness were more likely to rate their breathing as more intense in a word association task compared to patients who did not experience these emotions (Michaels, Meek, & Dedkhard, 2008). Both hopelessness and helplessness could be associated with lower SES, poorer QoL and illness perceptions possibly through lower levels of personal and treatment control as well as perceptions of more severe consequences. These findings provided some clues for a possible association between negative affect and health status in patients with COPD.

c. Interpretation of findings

The statistically significant relationships that were found between the predictor variable (SES) and the predicted outcomes (QoL/HCA) and for mediation by the proposed mediators (illness perceptions, self-efficacy and social capital) could have increased the likelihood of Type 1 error. The large number of statistical tests that were conducted to examine the relationships between the variables could have led to false positive findings except where the p value was lower than 0.01. The likelihood that one of the variables will reach the conventional level of significance of <0.05 is increased at the $p<0.05$ level. Reducing this threshold to $p<0.01$ (a conventional alteration in the Bonferroni correction) decreases the likelihood of such an error considerably.

Several forms of a broad predictor (income level, educational level, occupational status and IMD scores) were used to examine SES in this thesis. Not all of these four indicators reached statistical significance in their associations with the predicted outcomes (QoL/HCA). For example, income level appeared to be the indicator which showed more consistent relationships with QoL while IMD scores or educational level did not. This could reflect the appropriateness of the specific indicator for the particular participants who were recruited in this study the majority of whom are retired and/or for the particular outcome examined i.e. QoL. However, it is also likely that the statistical significance of income level in relation to QoL could also have been due to Type 1 error.

Although significant associations were found between predictor (SES) and predictive variables (HCA/QoL) as well as for mediation of these relationships by the proposed mediators (illness perceptions, self-efficacy and social capital), it has to be emphasised that the effect sizes were very small. This suggests that the focus should not be on whether one variable is a stronger predictor of another variable but rather on the fact

that these statistically significant relationships were too small to be able to account for a substantial proportion of the variance. Thus, the predictors identified would not be as strong as originally hypothesised.

9.3 Strengths of the research

The present study had a number of strengths. A variety of measures were used to assess SES, QoL and HCA in a robust manner to capture a breadth of different aspects of SES, QoL and HCA. Four measures of SES were employed in the current study: weekly household income level, educational attainment, occupational class and IMD which is a continuous measure of deprivation. In this study IMD was used in the form of both scores and quintiles. Quintiles were computed to group participants by deprivation level and capture potential differences in HCA and QoL. This might not have been identified with the scores if the relationship between IMD and HCA or QoL had not been linear. There were a number of reasons why five indicators of SES were used. First of all, SES is viewed as a multidimensional construct that consists of a variety of socio-economic factors such as financial resources, power or status (Lynch et al., 1997; Macintyre et al., 1998; Diez Roux et al., 2001). Secondly, a person's health could be affected by different socio-economic factors on various levels (e.g. individual, household or neighbourhood) and in varying ways (e.g. vulnerability, effects on physical status) depending on their age or stage in life (Singer and Ryff, 1997; Steptoe and Marmot, 2002). Third, previous studies suggested that additional factors such as socio-economic characteristics of the neighbourhood where a person resides could influence their health status beyond their individual-level SES (Robert, 1999; Pickett and Pearl, 2001). This could be operating through the physical, social or service environments in a variety of ways such as dietary patterns, exercise levels or neighbourhood violence (Macintyre & Ellaway, 2000; Morland, Wing, Diez Roux, & Poole, 2002; Sampson, Raudenbush, & Earls, 1997). Finally, due to COPD affecting people mainly in their 60s, participants' age was considered in the selection of SES measures. Previous research suggested that educational and income level as well as occupational class might not be as appropriate indicators of SES in later age compared to younger adulthood (Braveman et al., 2005; Kaplan et al., 1987; Liberatos et al., 1988). SES characteristics held earlier in life such as occupation or education would not necessarily be reflected in current SES, for example due to loss of income or loss of prestige due to retirement (Kaplan et al., 1987). Prestige associated with

occupational class could influence HCA in a beneficial way perhaps through patients' higher levels of assertiveness to secure health care services they felt they needed. However, in the present study, income level was the SES measure significantly associated with HCA and QoL in COPD while the educational level, occupational class and IMD score were not. This suggested that income might be able to reflect people's circumstances in later adulthood more appropriately possibly due to its relevance to individual-level SES providing people with higher buying power and enabling them to secure a more comfortable lifestyle.

Additional SES indicators that might have provided more information in the assessment of its effect on HCA and QoL in the present sample are liquid assets and material circumstances such as car and home ownership (Robert & House, 1996). Previous research found that liquid assets and home ownership were not better predictors of self-rated health but they were better predictors of functional health in comparison to income and education for people aged 65 to 84 (Robert and House, 1996). Liquid assets are essentially financial assets because they can be converted into cash quickly. Liquid assets include stocks or government bonds and can be considered as a form of investment. They are slightly different to income which is available as a ready sum of money to be consumed at any time (Robert and House, 1996). Childhood SES could have been used as a further indicator of SES due to its association with adulthood SES (Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Rogers, Nam, & Hummer, 1995) and its influence on health in later life irrespectively of adulthood SES (Smith, Hart, Blane, & Hole, 1998; Dennehy, Smith, Harker, Smith, & Ben-Shlomo, 1997; Lynch et al., 1997).

The variability and the strengths and weaknesses of the different SES measures used in the present study are reflected in the associations between these measures. Educational attainment and income level were weakly correlated (r=0.29) which mirrored previous studies that reported correlations lower than 0.50 (Gazmararian, Adams, & Pamuk, 1996; Braveman et al., 2001; Winkleby et al., 1992). This suggested that higher education was not strongly associated with higher income level. Income can show variations at similar educational levels across different as well as within social groups (e.g. age, sex). One possible explanation is that other variables such as social capital might be involved in the relationship between education and income. Social capital i.e. the availability of social networks and relationships might contribute to the accumulation of resources by individual members of groups through their membership of those groups (Pope, 2003). IMD similarly showed weak correlations with education

(r=-0.16) and income (r=-0.20). This finding was not surprising due to the fact that IMD is a composite area-level score of deprivation whereas educational and income level are individual-based measures. Occupational status was the only SES measure which was not significantly correlated to any of the other SES measures possibly because of participant characteristics. Due to retirement status, occupational class held previously may not have been a reliable indicator of patients' current SES (Robert and House, 1996).

Based on the aforementioned findings, it can be hypothesized that each measure assesses different aspects of SES. In the particular participant sample, findings indicated that weekly household income level was the SES measure that most reliably captured associations primarily with QoL. This was possibly due to the characteristics of the participant sample such as more advanced age and individual needs. Perhaps income could have provided people with services or goods that could improve their quality of life such as healthier food or exercise options. For HCA, the role of income was less pronounced. Some evidence for income level as well as IMD was found indicating that HCA outcomes might require different measures of SES to capture differences.

A further strength of the present study was the number and nature of the participant sample. The number of participants recruited and the range of practices from which they were recruited was large enough to include patients across the range of SES, disease severity, and include a wide range of QoL, HCA and psychosocial characteristics. The sample size was also sufficient to allow a series of statistical analyses with respectable power. Participants were representative in a number of domains when compared with other COPD populations such as (a) SES, (b) disease severity, (c) quality of life, (d) illness perceptions, (e) self-efficacy and (f) social capital. These will be described below.

This study included 176 patients with COPD representing the whole spectrum of socio-economic classes as well as disease stages. Mean IMD score was 33.5 (SD=10.9) which indicated a relatively high level of socio-economic deprivation in comparison to the rest of the population in the UK, but characteristic of the specific London Boroughs selected for this research (IMD 2010; Office of National Statistics, 2011). For example, the mean IMD score for London is 25.2 and for the whole of England 21.8 (Office of National Statistics, 2011; IMD 2010) in contrast to Lambeth and Southwark where the mean IMD score is 30.6. The higher prevalence of COPD in the more deprived section

of the population is consistent with previous findings (Soriano, et al., 2000; Simpson et al., 2010) and is reflected in the participant sample characteristics. Irrespective of the local prevalence of COPD, as expected, the majority of COPD patients in the present sample were in the most socio-economically deprived groups. For instance, weekly household income level 1 (most deprived) included 44.3% of the sample compared to weekly household income level 5 (least deprived) which included 11.4%. Previous research reported three times higher COPD prevalence in the most socioeconomically deprived classes in comparison to the most affluent patients (Simpson et al., 2010; Soriano et al., 2000).

With regard to disease severity, the majority of patients had moderate COPD (Grade 2: 50.6%), a third had severe COPD (Grade 3: 29.5%) and fewer had mild and very severe disease (Grade 1: 14.8% and Grade 4: 5.1%, respectively) with a mean FEV1 % predicted of 59.3%. All 176 patients had their diagnosis of COPD confirmed by spirometry as part of their interview. The distribution of COPD severity stages showed that the majority of patients had Grade 2 disease followed by Grade 3, Grade 1 and finally Grade 4. This pattern mirrors the severity distribution reported by previous studies conducted in Europe (GOLD Grade 1: 12.3%, GOLD Grade 2: 47.8%, GOLD Grade 3: 30.3% and GOLD Grade 4: 8% in Belgium, France, Germany, Italy, the Netherlands, Spain and the UK) (Jones, et al., 2011) as well as in the United States (GOLD Grade 1: 19%, GOLD Grade 2: 50%, GOLD Grade 3: 26% and GOLD Grade 4: 5%) (Mapel, Dutro, Marton, Woodruff, & Make, 2011).

Quality of life, illness perceptions and self efficacy scores were more positive compared to participants' scores reported in the literature. For example, overall participants' quality of life was better and their illness perceptions were more positive (except for personal control and emotional representations) compared to the participant samples with COPD in Dransfield et al.'s (2011), Wither et al.'s (1999), Vogel, Godefroy, van der Mey, le Cessie, & Kaptein's (2008), Scharloo et al.'s (2007) and Geijer et al.'s (2007) studies. Differences in QoL between these patient groups could be due to a variety of factors. For example, Dransfield et al. (2011) found that 36% of their participants did not have airflow limitation which meant they did not meet the criteria for COPD. However, these patients reported burden of poor QoL and respiratory complaints comparable to participants with confirmed COPD. The authors attributed participants' poorer QoL not to COPD but to depression or cardiovascular disease which frequently co-exist with respiratory problems. Withers et al.'s (1999) participant sample included severe COPD patients which could explain why participants in the present sample

reported better QoL in terms of anxiety and depression and more positive illness perceptions. More severely affected COPD patients might suffer more severe symptoms of dyspnoea and fatigue which could intensify feelings of anxiety, depression and negative perceptions of their illness. Differences in illness perceptions could be explained in the same way. Scharloo et al.'s (2007) participant sample included Grade II (moderate) and III (severe) COPD patients. This could be the reason why patients in the present study reported better QoL in terms of anxiety and depression and more positive illness perceptions. In addition, participants' mean FEV_1 % predicted in Scharloo et al.'s (2007) study was 49% while in the current study it was 59%.

Participants' level of self-efficacy was greater than that of arthritis patients (Schwarzer et al., 1992). In contrast, patients' level of perceived breathlessness was higher compared to participants in other studies (Dransfield, et al., 2011). The reasons for the difference in dyspnoea levels between the present sample and Dransfield et al. (2011) were probably identical to the ones provided for QoL.

Social capital was lower on average than that reported by Onyx and Bullen (2000) in Australia (mean of 2.6 vs. 3.0). Social capital reflects mainly area characteristics such as neighbourhood connections and feelings of trust and safety. Lambeth and Southwark were more deprived in comparison to New South Wales which was reflected in lower social capital scores, for example lower feelings of trust and safety and fewer neighbourhood connections. Moreover, Australian study focused on measuring social capital in a population without any health problems. COPD could have posed restrictions on the use of networks and friend and family connections - irrespective of deprivation - if symptoms made it difficult for patients to socialise. Increased limitation in engaging in social activities might be due to the very nature of COPD. Progressive deterioration of the disease and increased symptoms can have an impact on patients' mobility. This limitation might also be intensified by higher deprivation and further decrease social functioning.

Another strong point of this research was that the interviews were held at patients' homes. This increased the likelihood of more severely affected individuals who might have been less mobile to participate in the study. The option of weekend or evening interviews was also provided in order to increase participation from younger patients who were still employed. A further strength was the fact that there were no missing data in the administered instruments because the researcher made sure all questions

had been answered. If any questions had remained unanswered by omission, the participant was asked to complete them before the researcher left. In addition, diagnosis of COPD was confirmed by spirometry in all participants. Confirmation of diagnosis was necessary given that the rate of diagnostic inaccuracy in COPD has been reported to be approximately 40% (Miravitlles et al., 2012).

The choice of instruments added to the strengths of the study. The QoL instruments assessed various aspects of patients' physical and mental status. This ensured that participants were offered a number of different ways to indicate the impact of COPD on their well-being. Assessment of HCA also included questions covering a range of health care access dimensions such as smoking cessation referrals, PR awareness, referrals, attendance and completion, pharmacological treatment approriateness. These data were based on patient self-report which could involve inaccuracies in information about referrals and services provided. This information could have been confirmed through GP practice patient databases. However, it was beyond the capacity of this research to assess HCA through individual GP records. Previous research provided evidence for good overall agreement between self-report and record-based HCA measures with variations in certain domains. For example, concordance was high for medication use but low for counselling and referrals in patients with a variety of conditions including COPD (Tisnado, et al., 2006). Counselling and referrals were under-reported in the medical records which could have been due to recall bias by the patients. However, it could also be due to under-report by physicians who might not have kept accurate records of these interventions (Rohrbaugh & Rogers, 1994; Stange, et al., 1998). Under-reporting of ambulatory physician visits extending over a year compared to patient-records was also observed (Roberts, Bergstralh, Schmidt, & Jacobsen, 1996). However, Roberts et al.'s (1996) participants included a random sample of healthy community dwelling. In the present study, the wide range of dimensions assessed and the high level of detail in relation to these dimensions such as duration of participation in PR, exacerbations, reasons for non-completion added to the robustness of the findings.

A variety of statistical tests were used to examine multiple relationships between the variables such as multiple mediation analysis using bootstrapping techniques (Hayes, 2012). This type of statistical analysis provides information on underlying pathways of influence within one significant relationship. For instance, the relationships between SES and QoL might have been due to SES affecting personal and treatment control. Incorporating these variables in future interventions could increase their effectiveness

in improving patients' QoL. While illness perceptions, self-efficacy and social capital mediated the relationship between income level and QoL, they could account only for a small amount of the variance. The associations found between SES in terms of income level and QoL were partly due to these variables (i.e. illness perceptions, self-efficacy and social capital) but a large amount of the relationship still remains to be explained.

9.4 Limitations

There were some limitations in the current study. The low response rate (26%) decreased the likelihood of representativeness of the population. Although self-selected, the sample does contain patients from the full range of disease severity, a broad range of SES and GP practices. Thus, it is unlikely that HCA outcomes would be biased by a uniform style of clinical management. By implication health care access such as varying levels of health care services available in different GP practices e.g. smoking cessation referral, drug prescriptions or secondary care referral would be representative as well. However, it could be possible that the sample was biased in terms of illness perceptions and self-efficacy. For example, patients who participated in the study might have had more negative illness perceptions and lower self-efficacy compared to those who did not participate. This could have motivated them to consent to the research perhaps in the hope of receiving more information about illness management, medications or additional assessment. If demographic characteristics between responders and non-responders could be compared, stronger conclusions could be made. However, lack of data on non-responders prevents further analyse.

A further limitation was that data was based on self-report and the likelihood of measurement overlap cannot be excluded. Due to the similarity between certain questions across the questionnaires that were used, identical concepts might have been measured. This could have resulted in strong correlations between the assessed items. For example, a number of questions of the Chronic Respiratory Questionnaire (CRQ-SAS) showed significant overlap with certain questions of the Illness Perceptions Questionnaire - Revised (IPQ-R) such as: (a): "How often during the last 2 weeks did you have a feeling of fear or panic when you had difficulty getting your breath?" (Q7; CRQ-SAS) with "My airways disease makes me feel afraid" (Q38; IPQ-R); (b) "How often during the last 2 weeks have you felt embarrassed by your coughing or heavy breathing?" (Q9; CRQ-SAS) with "My airways disease strongly affects the way others see me" (Q9; IPQ-R); (c) "In the last 2 weeks, how much of the time did you feel very

confident and sure that you could deal with your illness?" (Q 10; CRQ-SAS) with "I have the power to influence my airways disease" (Q16; IPQ-R) and with "There is a lot which I can do to control my symptoms" (Q12; IPQ-R); and (d) "In general, how much of the time did you feel upset, worried, or depressed during the last 2 weeks?" (Q12; CRQ-SAS) with "I get depressed when I think about my airways disease" (Q33; IPQ-R) and with "When I think about my airways disease I get upset" (Q34; IPQ-R) and with "My airways disease does not worry me" (Q36; IPQ-R).

QoL is subjective and thus cannot be assessed in a way other than self-report. Disease status is assessed by objective measures such as FEV_1 predicted and does not correlate strongly with QoL. A patient might have mild COPD (assessed on the basis of FEV_1% predicted), but might perceive his or her breathlessness to be intense and detrimental to their everyday life. This discrepancy is supported by the fact that subjective measures of disease experience and subjective measures of health status differ significantly. For example, subjective measures such as patients' perceptions of dyspnoea were strongly associated with quality of life, functional status and depression whereas objective measures such as disease severity based on spirometry and exacerbations risk were not (Adams et al., 2012). This difference could be due to the fact that both patients' perceptions of dyspnoea and QoL were based on self-report while objective disease measures were not. Moreover, differences in biological and functional characteristics or co-existing conditions such as depression or cardiovascular disease could have contributed to the lack of concordance between QoL and objective measures of COPD (Dransfield et al., 2011).

The cross-sectional nature of the study provided insight into measures at a specific point in time. Longitudinal studies need to be conducted in the future in order to examine whether these relationships change over time and in what way. In addition, while mediation analysis can elucidate the pathways of the relationship among variables, it cannot provide causal associations. The design of the present study may limit conclusions but it cannot be considered weak. It could be argued that change in health might result in a change in income. The likelihood of this change decreases in later life - one of the main characteristics of the participants in this study. Health can influence income through loss of paid employment due to health problems. The main source of income among the elderly is their pension, which is unaffected by contemporaneous health problems (Benzeval & Judge, 2001). Because SES in earlier life can affect health in later life irrespective of adulthood SES, direction of causality cannot be inferred (Lynch et al., 1997; Smith and Ben-Shlomo, 1997; Smith et al.,

1998). Similary, causality cannot be established for the relationship between illness perceptions, self-efficacy, HCA and QoL. Interpretation could follow two directions. Poorer QoL might have led to more negative illness perceptions and lower self-efficacy due to the burden of the disease. Alternatively, more negative perceptions of their illness and lower self-efficacy could have contributed to poorer QoL through lower physical activity levels or poorer disease management or medication adherence.

While patients' illness perceptions were examined in the present study, physician attitudes and perceptions were not explored. The medical interaction relies on two-way communication and the consistency of explanatory models of illness held by health care professionals and patients can vary. Therefore, it is important to investigate the role of health care provider characteristics in the relationship between SES and HCA and QoL in COPD patients.

The present study was quantitative. A qualitative section could have provided more detailed information and better understanding as to the nature of the associations investigated. Additional findings that emerged from the study such as the relationship between the psychosocial variables and HCA and QoL could not be pursued further because they were beyond the scope of the current research. However, it can provide the starting point for further research to explore these relationships in more detail.

Regarding the analysis of the data, statistically significant relationships were found between the predictor variable (SES) and the predicted variable (QoL/HCA). However, the size of these relationships was smaller than expected. Therefore, the size of the relationship that was mediated by the proposed mediators (illness perceptions, self-efficacy and social capital) would also be smaller than expected. This would have required a larger sample size than the one available in this study in order to detect these very small effects of mediation. It is arguable whether it would be justified to have a larger sample size to detect mediation of such small effects since it is unlikely that such mediation would have any practical value in a clinical setting.

9.5 Key points and conclusions

This was the first study to explore associations between SES and HCA and QoL in patients with COPD and to examine the role of illness perceptions, self-efficacy and social capital as mediators in these relationships. The significant relationships between SES and HCA and QoL suggested that more deprived COPD patients were not at a

disadvantage regarding HCA. In contrast, for certain HCA measures lower SES individuals in terms of IMD and educational attainment had greater access to health care compared to their higher SES counterparts. The remaining aspects of SES such as occupational status and income level were not significantly associated with HCA.

QoL in COPD appeared to be negatively associated with SES in terms of income level. Other SES measures (IMD, educational level and occupational class) were not significantly associated with QoL. Present findings are consistent with the systematic review on the relationship between SES and QoL in patients with COPD (see Chapter Four). The review indicated that there was limited quality literature on SES and QoL in COPD to draw strong conclusions about these associations. Most studies found that lower SES was associated with poorer quality of life in patients with COPD consistent with present findings.

The lack of associations between most aspects of SES and HCA and QoL could be attributed to the nature of COPD, increased awareness on behalf of health professionals which could have facilitated access for more deprived patients, or individual factors such as patients' illness perceptions. Furthermore, the lack of health inequalities may be associated with the more advanced age of the participant sample according to the age-as-leveler hypothesis. This theory posits that universal biological frailty in old age and government support to the elderly, such as free prescriptions, or the National Service Framework decrease the gap in health care usage by SES (Beckett, 2000; House, Lantz, & Herd, 2005; House et al., 1994). According to the age-as-leveler hypothesis, socioeconomic deprivation in risk factors such as health behaviours, stress, perceptions of control, and availability of social support accumulates throughout most of adulthood but is ameliorated in later life through retirement and provision of government support. This does not mean that income becomes less powerful because these government provisions refer mostly to the wider societal-level domains such as availability of free health care services while income would be more relevant to individual-level domains such as QoL. It must also be noted that, there was increased likelihood of Type 1 error depending on the size of the p values. The inconsistent associations found in terms of SES indicators such as income level, educational level, occupational class and IMD score could have been false positive findings because of the large number of statistical tests conducted. However, due to the significance level used in this research i.e. $p<0.01$, this would probably be unlikely. Still, the results possibly need to be interpreted as exploratory and as a guide to generate hypotheses for future research in this area.

9.6 Implications for future research

The current study highlighted that most aspects of SES did not have a significant impact on HCA and QoL in patients with COPD living in South East London. The sporadic relationships and the nature of the associations that were found between these variables provide ground for further research into the role of psychosocial factors in COPD. They indicated that relationships do exist but they are limited to certain measures of SES and aspects of HCA and QoL which suggesting that additional measures need to be used in order to capture further associations that may exist. The cross-sectional design of the study limited interpretation of results as to causality. Longitudinal studies with participant follow-up over the course of time could help identify changes in illness perceptions and self-efficacy at different stages of the disease. This is important since COPD is a slowly progressing condition with symptoms deteriorating after a long time of subtle existence. The cost of this kind of study would need to be considered as well as the possibility of a higher attrition rate. The fact that the time of onset of COPD is difficult to identify because of its slow progression and subtle emergence of symptoms over time would probably be a factor to be taken into account when designing such as study.

Socio-economic status (in terms of income level) was associated with QoL to an extent. Illness perceptions and self-efficacy mediated the relationship between income level and QoL suggesting that psychological variables may play a role in these associations. Higher SES in terms of income level was associated with more positive illness perceptions such as weaker identity and consequence beliefs as well as stronger self-efficacy which were associated with better QoL. This was independent of health care access which was not lower in more deprived populations. It could be suggested that illness perceptions in particular and to a lesser degree self-efficacy and social capital could be included in the design and development of interventions targeting improvement of QoL in COPD. However, the difficulty in modifying illness perceptions, the small amount of variance explained by illness perceptions and the magnitude of their effect size would probably not lead to significant differences in outcomes. This is supported by evidence from interventions which attempted to modify illness perceptions. While a change in patients' treatment beliefs and their understanding of their condition was observed, this change did not lead to a change in behaviour, for example, increase in treatment adherence (Karamanidou et al., 2008). Although the

present research has provided strong evidence for certain associations, it has also indicated that there are further variables to be considered in order to illuminate the nature of these relationships. Further research is warranted to identify additional psychosocial and biological variables (e.g. hostility, anger, stress response and physical effect) as well as physician-related factors (e.g. attitudes and perceptions) in order to increase our understanding of the associations between SES and HCA and QoL in COPD. In addition, future research might also attempt to increase representativeness of participants in terms of illness perceptions, self-efficacy and social capital through increasing response rates, for instance through administration of questionnaires by GPs during patients' routine visits as part of their consultation.

Appendices

Appendix A: SYSTEMATIC REVIEW SUPPLEMENTARY TABLES

Appendix A1 – Supplementary Table 4.1: Search terms for Medline

Table 4.1 Search terms for Medline

socioeconomic status.mp. or exp Social Class/
social networks.mp. or Social Support/
exp Psychosocial Deprivation/
chronic obstructive pulmonary disease.mp. or exp Pulmonary Disease, Chronic Obstructive/
COPD.mp. or Pulmonary Disease, Chronic Obstructive/
Emphysema/ or Pulmonary Emphysema/
chronic bronchitis.mp. or exp Bronchitis, Chronic/
socioeconomic status.mp.
social class.mp.
social networks.mp.
social support.mp.
psychosocial deprivation.mp.
social capital.mp.
exp Socioeconomic Factors/ or exp Health Services Accessibility/ or exp Social Support/ or exp Health Status/ or social capital.mp. or exp Social Environment/
exp Primary Health Care/ or healthcare access.mp.
health services utilisation.mp.
healthcare access.mp.
health outcome*.mp.
exp "Outcome and Process Assessment (Agabiti, et al.)"/ or exp "Outcome Assessment (Agabiti, et al.)"/ or exp "Quality of Life"/ or health outcome*.mp. or exp Treatment Outcome/ or exp Health Status/
disease outcome.mp.
disease outcome.mp.
quality of life.mp.
quality of life.mp. or exp "Quality of Life"/
health status.mp. or exp Health Status/
health status.mp.
1 or 3 or 8 or 9 or 12 or 14
2 or 10 or 11 or 13
4 or 5 or 6 or 7
15 or 16 or 17 or 19
18 or 19 or 20 or 21 or 22 or 23 or 24 or 25
26 and 27 and 28 and 29 and 30

Appendix A2 – Supplementary Table 4.2: Quality assessment scale

Table 4.2 Quality assessment scale

Checklist	Study Quality Assessment			
Quality items	+ : Fullfilled	+/- : Partially fulfilled	- : Not fulfilled or no info. provided	N/A : Not applicable to study
1. Spirometry-based diagnosis				
2. COPD severity assessed/classified				
3. COPD severity controlled for				
4. Sample size (sufficient power?)				
5. Description of population selection				
6. Inclusion criteria applied				
7. Adequate description of methods (i.e. clear explanation of participant recruitment, inclusion criteria, methods of assessment, etc.)				
8. Clear definition & classification of SES (i.e. low- medium-high)				
9. Clearly defined & reliably measured HRQOL (i.e. validated instruments)				
10. Clearly defined & reliably measured HA				
11. Examination & report of statistical analyses between SES & HRQOL &/or HA and quality of analyses.				
13. Registration of loss to follow-up (if applicable)				

Appendix A3 – Supplementary Table 4.3: Quality Assessment Scale and Scores

	Quality Items												
Study	Spirometry-based diagnosis	COPD severity assessed/classified	COPD severity controlled for	Sample size	Adequate description of population selection	Inclusion criteria applied	Adequate description of methods	Clear definition & classification of SES (i.e. L-M-H)	Clearly defined & reliably measured QoL (i.e. validated instruments	Clearly defined & reliably measured HCA	Examination & report of stat. assoc between SES & HCA &/or QoL	Registration of loss to follow-up (where applicable)	Quality Assessment Score (out of 12)
Saadat et al. (2007)	+	+	-	+	+/-	-	+	+	+	N/A	+	N/A	7.5
2. Eisner et al. (2011)	+	+	+	+	+	+	+	+	N/A	+	+	+/-	10.5
3. Enright et al. (1994)	+	_	+	+/-	+	+/-	+	+/-	+/-	N/A	+	N/A	7
4. Hesselink et al. (2006)	+	+	-	+	+	+	+	+	+	N/A	+	+	10
5. Hill (2005)	+	+	+	+	+	+	+	+	+	N/A	+	N/A	10
6. Johannessen et al. (2010)	+	-	-	+/-	+	+/-	+	+	-	N/A	+	+	7
7. Kanervisto et al. (2006)	+	+	-	+/-	+	+/-	+	+	+	N/A	+	N/A	8
8. Lin et al. (2005)	-	-	-	+/-	+	+/-	+	+	+/-	N/A	+	N/A	5.5

Study	Spirometry-based diagnosis	COPD severity assessed /classified	COPD severity controlled for	Sample size	Adequate description of population selection	Inclusion criteria applied	Adequate description of methods	Clear definition & classification of SES (i.e. L-M-H)	Clearly defined & reliably measured QoL (i.e. validated instruments	Clearly defined & reliably measured HCA	Examination & report of stat. assoc between SES & HCA &/or QoL	Registration of loss to follow-up (where applicable)	Quality Assessment Score (out of 12)
9. Moy et al. (2009)	+	-	-	+	+	+	+	+/-	+	N/A	+	N/A	7.5
10. Ng et al. (2007)	+	+	+	+	+/-	+	+	-	+	N/A	+	+	10
11. Prescott et al. (2009)	+	-	-	+/-	+	+/-	+	+	N/A	+/-	+	+	7.5
12. Prigatano et al. (1984)	-	-	-	+	+/-	+	+	-	+	N/A	+	N/A	5.5
13. Shohaimi et al.	-	-	-	+/-	+/-	+	+	+	-	N/A	+	N/A	5
14. Van Manen et al. (2002)	+	+	-	+	+	+	+	+/-	+	N/A	+	N/A	8.5
15. Welle et al. (A. M. a. M. J. C. P. r. p. i. t. U. a. n. r. s. C. r.-. Yohannes, et al.)	+	-	-	+/-	+	+/-	+	+	-	N/A	+	N/A	6
16. Wijnhoven et al. (2001)	+	-	-	+	+	+	+	+	+	N/A	+	N/A	8
17. Goldstein et al. (2005)	-	+/-	+	+/-	+/-	+	+	+/-	N/A	+	+	N/A	7

Study	Spirometry-based diagnosis	COPD severity assessed/ classified	COPD severity controlled for	Sample size	Adequate description of population selection	Inclusion criteria applied	Adequate description of methods	Clear definition & classification of SES (i.e. L-M-H)	Clearly defined & reliably measured QoL (i.e. validated instruments	Clearly defined & reliably measured HCA	Examination & report of stat. assoc between SES & HCA &/or QoL	Registration of loss to follow-up (where applicable)	Quality Assessment Score (out of 12)
18. Montes de Oca et al. (2008)	+	+	-	+	+	+	+	-	N/A	+	+	N/A	8.5
19. Simoni et al. (2008)	+	-	-	+/-	+	+/-	+	+	N/A	+	+	N/A	7
20. Chandra et al. (2009)	+/-	-	-	+	+	+	+	+/-	N/A	+	+	+	8
21. VanderSchaaf et al. (2010)	+	+	+	+	+/-	+/-	+	+	N/A	+/-	+	N/A	8.5

+ : Fullfilled	+/- : Partially fulfilled	: Not fulfilled or no information provided	N/A : Not applicable to the study

Appendix B: GP PRACTICE STUDY INFORMATION PACKAGE

Appendix B1: GP practice invitation letter

GP Practice Letterhead
Practice Manager
Practice Address
Date
Dear „Practice Manager“

Re: ATHENA project: Access To HEalthcare iN Airways disease

I am writing to ask for your help with a new research project whose aim is to find ways of improving healthcare access and quality of life for patients with COPD (Chronic Obstructive Pulmonary Disease) patients. The research is being undertaken with practices in Lambeth and Southwark Primary Care Trusts. I attach a sheet which summarises the study and what it would entail for the practice.

Patients with COPD will be identified from the existing lists of COPD patients made by your practice for the Study of Intractable Breathlessness in COPD in which you have been participating. Letters of invitation prepared by us will be printed by the practice for signature by a practice GP and sent to eligible patients. Participating patients should: (a) have a diagnosis of COPD, and (b) the ability to understand and respond to questionnaires and interview questions in English.

Eligible patients will be contacted after having expressed interest in the study and asked to agree to be interviewed in their homes. The interview will last between 60 and 90 minutes. It will involve completing questionnaires about the way the illness affects patients' psychological and physical health and their access to services.

Enclosed with a description of the project are the patient invitation letter we would like to use and a patient information sheet (PIS) for patients telling them about the study. I will contact you by telephone within the next two weeks to see if the practice will be

able to help with this research. Your support in this research would be much appreciated.

Yours sincerely,

Sofia Georgopoulou

PhD Student

ATHENA project: Access **T**o **HE**althcare i**N A**irways disease

Lead Investigator: Sofia Georgopoulou sofia.georgopoulou@kcl.ac.uk 02078488734

Project Supervisor: Dr. Patrick White patrick.white@kcl.ac.uk 0207 848 8769

Guy's, King's and St Thomas' School of Medicine
Department of Primary Care & Public Health Sciences

Head of Department
Professor Brendan Delaney

7th Floor, Capital House
42 Weston Street
London SE1 3QD
Tel 020 7848 6649
Fax 020 7848 6620
Email gp@kcl.ac.uk

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University of London

Appendix B2: GP practice (patient) study information sheet

ATHENA project: Access To HEalthcare iN Airways disease

Project Summary

We are writing to ask for your help with research that we are doing in people with COPD. This sheet gives a brief summary of the research and what will be entailed for the practice should you decide to take part. The study will provide us with information about the role of socio-economic deprivation and how it may impact on COPD patients' quality of life and their access to health services. This will help us to better understand the factors influencing patients' healthcare utilisation and well-being. Our aim is to find ways of improving healthcare access and the outcome of the disease for people with COPD.

We need your help to identify patients who are suitable to take part in this research. This will be done by using the existing lists of COPD patients made by your practice for the Study of Intractable Breathlessness in COPD in which you have been participating.

We are looking for COPD patients who fit the following two eligibility criteria: a) a diagnosis of COPD (including emphysema or chronic bronchitis or both); and b) ability to understand and respond to questionnaires and interview questions in English.

We would like the practice to send to eligible patients a letter of invitation to participate in the study. Patients who are interested will be asked to contact Sofia Georgopoulou directly or to send a reply paid letter to the practice which she will then pick up. Non-respondents will be followed up with a reminder letter. Sofia will then arrange to interview consenting patients at their home. The interview will last between 60 and 90 minutes and will be held at patients' homes for their convenience. Patients will be asked at interview to allow access to their medical records. The information required from patients' medical records will include: (a) other conditions patients may be suffering from, (b) their current treatment, (c) spirometry test results, (d) date of COPD diagnosis, (e) referrals given by their GP or consultant, and f) frequency and type of contacts with health services in the previous five years.

The interview will involve completing questionnaires about the way the illness affects their psychological and physical health and their use of health services. Patients' will have their lung function, and their height and weight assessed as well. Information gathered at interview including spirometry results will be summarised and provided to the practice. Patients will be free to withdraw from the study at any time without giving a reason. They will also be told this will not affect the care they receive from their GP practice. Patients' details and other information provided will be destroyed at the end of the study.

The key people working on the study are:

Miss Sofia Georgopoulou, PhD Student and Chief Investigator
Dr. Patrick White, Senior Lecturer and Supervisor of the project

If you have any questions, please contact Sofia Georgopoulou on 020 7848 8734 or at sofia.georgopoulou@kcl.ac.uk

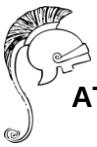
Appendix C: ELIGIBLE PARTICIPANT STUDY INFORMATION PACKAGE

Appendix C1: Participant invitation letter

GP Practice Letterhead

Date

Dear



ATHENA project: Access To HEalthcare iN Airways disease

I am writing to ask you if you would take part in a new research study which we are doing with the Department of Primary Care and Public Health Sciences at King's College London. Our aim is to explore the things that make your chest trouble difficult and that interfere with the healthcare you receive. We want to find ways of improving your condition and our services. This study will provide you with the opportunity to tell the researchers how you are affected by your chest trouble. We are calling your chest trouble your airways disease. There is an information sheet with this letter for you to read.

If you think you would be interested in taking part, or just finding out more, please return the enclosed slip and the contact details sheet to us in the envelope provided. Alternatively, you can phone Sofia Georgopoulou, the study researcher, directly on 020 7848 8734. If we do not hear from you, we will send you a reminder letter in three weeks. If you do not wish to take part, please tick the appropriate box on the enclosed slip, return it to us and we will not contact you again about this research. If you are interested in taking part, Sofia will make a convenient time to visit you at home, or somewhere else if you prefer. Calling or writing for further information does not mean you have to take part. If you don't want to take part, your care will not be affected in any way.

We do hope you will be able to help us in supporting this study.

Yours sincerely

Dr (name of principal)

Guy's, King's and St Thomas' School of Medicine
Department of Primary Care & Public Health Sciences

Head of Department
Professor Brendan Delaney

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Fax 020 7848 6620
Email gp@kcl.ac.uk

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On behalf of (name of practice)

Encs (3)

Appendix C2: Participant study information sheet

Patient Information Sheet

ATHENA project: Access To HEalthcare iN Airways disease

This study aims to learn about the impact of your chest trouble on your daily life and how effective the health services are for you. It will give us the opportunity to learn about your experience with your chest trouble, airways disease. You are being invited to take part in this research study and it is important for you to understand why the study is being done and what it will involve. Please take time to read the following information carefully. Discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Purpose of the study: The purpose of the study is to learn about the impact of your chest trouble on your daily life and how effective the health services are for you. Our aim is to find ways of improving your well being and your access to services. Sofia

Georgopoulou will be doing this study as part of her PhD degree in Primary Care Research.

Why have I been invited? We are asking many patients with airways disease if they will agree to help with this research so that we can understand more fully how they are affected and how their health services and general health could be improved.

Do I have to take part? It is up to you to decide whether or not to take part. If you do agree to take part you will have this information sheet to keep and you will be asked to sign a consent form. You can withdraw at any time and without giving a reason. This will not affect the care you receive in any way.

What will happen to me if I take part? We will arrange an interview at your home. Sofia Georgopoulou, the researcher, will explain the research and will answer any further questions you may have. She will ask you to sign a consent form agreeing to participate in the study. She will also ask you to allow us access to your medical records so we can learn about the treatment you have received so far. Sofia will ask you to complete some questionnaires and she will measure your height and weight and test your breathing. The questionnaires will ask how your chest trouble affects your daily activities and physical health. They will also ask about the social and financial resources available to you. The interview will take about an hour and a half and will be held at your home. If that is not convenient for you, we will arrange the interview in your GP's surgery.

What do I have to do? All you have to do is read this sheet and agree to take part by returning the enclosed slip and the contact details sheet to your GP practice. With your permission, the researcher, Sofia Georgopoulou, will then contact you and make an appointment for the interview. Alternatively, if you do not want to provide your details, you can contact Sofia directly and schedule an appointment.

What are the disadvantages or risks of taking part? We think there are no disadvantages or risks to you, apart from the time you would be giving up. Sometimes people get upset talking about their illness, but we find most people enjoy the opportunity to explain how they have been affected.

What are the possible benefits? If you agree we will pass a summary of the information that we get from the interview to your GP. For some people who take part this information may prove useful to their GP in making changes to their health services

provided. The information we get from this research will help us to learn how to improve the care of people with airways disease and make them more comfortable in their daily lives.

What if there is a problem? Any complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. In the unlikely event that something does go wrong, or that you are harmed during the research and the harm is due to someone's negligence, then you may have grounds for legal action for compensation. Such legal action would be against King's College London. In such an event you may have to pay your own legal costs. The normal National Health Service complaints mechanisms will still be available to you.

Will my taking part in this study be kept confidential? All information which is collected about you during the course of the research will be kept strictly confidential and we take special steps to ensure that this is done.

What will happen to the results of the research study? The results will be published in a research journal and will then be available to doctors and nurses who are looking after patients with airway disease.

Who is organizing and funding the research? The research is organised and funded by the Department of Primary Care and Public Health Sciences at King's College London School of Medicine.

Who has reviewed this study? This study has been reviewed by the East London Research Ethics Proportionate Review Sub-Committee 3.

Contact for further information

For further information about this study and about the results you may contact: Miss Sofia Georgopoulou, Department of Primary Care and Public Health Sciences, King's College London School of Medicine, 9th Floor, Capital House, 42 Weston Street, London SE1 3QD; Tel: 020 7848 8734; Fax: 0207848 6620; email: sofia.georgopoulou@kcl.ac.uk

Thank you for reading this information sheet. We hope you will be able to take part in the study.

Appendix C3: Participant reply slip

Patient Reply Slip

ATHENA project: Access To HEalthcare iN Airways disease

Patient Name: ……Date of Birth: ……Signature:……

Please tick as appropriate:

Yes, I would like to know more about this study. Please pass my contact details to the researcher so they can contact me with further information. ☐

No, I would prefer not to learn more about this study. Please do not contact me with further information. ☐

Please return this slip using the pre-paid and pre-addressed envelope provided.

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University of London

Appendix C4: Participant contact details form

ATHENA project: Access To HEalthcare iN Airways disease

GP Practice: _____

Chest clinic evaluation: Patient contact details

Title (please circle): Miss Mrs. Mr. Other: _____

Name: _____

Age: _____

Postal address: _____

_____

_____

Phone number: _____

The details on this form will be used by the researcher to contact you in order to arrange an interview. They will be held in a secure database in the Department of Primary Care & Public Health Sciences at King's College London. They will only be accessed by research staff and will not be passed on to any third party. Your contact details will be destroyed at the end of the project.

Appendix C5: Participant reminder letter

GP Practice Letterhead

Reminder Letter

Date

Dear

ATHENA project: Access To HEalthcare iN Airways disease

We are writing to remind you of the research study which we are doing with the Department of Primary Care and Public Health Sciences at King's College London, and with which you may wish to help. This study, as mentioned in our initial letter, will provide you with the opportunity to tell the researchers how your airways disease affects you. Our aim is to find ways of improving your condition and our health services.

Up to this date, we have not received the reply slip from you expressing interest in our research. We would appreciate it if you could let us know whether you would like to learn more about the study by returning the reply forms.

If your reply slip has already been sent, please disregard this letter. If you don't want to return the slip but do want to participate in the research, please call Sofia Georgopoulou, the study researcher, directly on 020 7848 8734. Please, remember that calling or writing for further information does not mean you have to take part. If you don't want to take part, your care will not be affected in any way.

We do hope you will be able to help us in supporting this project. Thank you for taking the time to read this letter.

Yours sincerely

Dr (name of principal)

On behalf of (name of practice)

Appendix D: PARTICIPANT INTERVIEW INSTRUMENTS

Guy's, King's and St Thomas' School of Medicine
Department of Primary Care & Public Health Sciences

Head of Department
Professor Brendan Delaney

7th Floor, Capital House
42 Weston Street
London SE1 3QD
Tel 020 7848 6649
Fax 020 7848 6620
Email gp@kcl.ac.uk

KING'S College LONDON
University of London

Appendix D1: Participant consent form

Patient Identification Number for this research study: _____

CONSENT FORM

Title of Project:

ATHENA project: Access To HEalthcare iN Airways disease

Name of Researcher: Sofia Georgopoulou
Department of Primary Care and Public Health Sciences
King's College London
9th Floor, Capital House
42 Weston Street
London SE1 3QD
Tel: 0207 848 8734
Email: sofia.georgopoulou@kcl.ac.uk

Please write your initials in each box if you agree to each statement:

1. I confirm that I have read and understand the patient information sheet (Version 3, dated 06 08 10) for the above study and have had the opportunity to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐

3. I understand that sections of my medical notes from the GP practice may be looked at by responsible individuals from the Department of Primary Care and Public Health Sciences, King's College London or from regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records. ☐

4. I agree to take part in the above study. ☐

5. I understand that my involvement is strictly confidential and no information about me will be used in any way that reveals my identity other than to the researcher(s). ☐

_____	_____	_____
Name of Patient	Date	Signature
_____	_____	_____
Name of Person taking consent	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Please tick the appropriate box(es):

Yes, I would like to be considered for participation in a follow-up study if one should take place in the future. ☐

No, I would not like to be considered for participation in a follow-up study if one should take place in the future. ☐

I would like to get feedback on the results of the study. ☐

Patient Name: ..... Date: .....…….... Signature: ….....…….....

Appendix D2 – Health Care Access (HCA): Variant of the Client Service Receipt Inventory CSRI including demographics and SES information questions

***ATHENA* project: Access To HEalthcare iN Airways disease**

Patient Healthcare Access Questionnaire

Patient ID:…….

SECTION A: MEDICATIONS

Now can I just check what medication you're using? ***(Inhalers, tablets, oxygen and the nippy machine)*** ***How often do you take this?***

Colour of medicine	Drugs (strength)	Frequency	Inhaler-type	Comment
	INHALERS			
Blue	**Inhalers/beta-agonists** 1. *Salbutamol* (Airomir, Asmanal, Autohaler, Click Haler, Easy-Breathe, Easy Haler Salbutamol, Pulvinal Salbutamol, *Salamo*l, Ventolin, Salbulin novolizer) 2. *Terbutaline* (Bricanyl)		Inhaler ☐ 1 Nebulizer ☐ 2 Both ☐ 3 N/A ☐ 4	
Green/ Turquoise	**Long-acting beta-agonists (strength)** 3. Salmeterol (Serevent) 3a. Formoterol (Atimos, Foradil, Oxis)			
Clear **Grey**	**Antimuscarinic bronchodilators (anticholinergic)** 4. Ipratropium (Atrovent, Respontin) 5. Tiotropium (Spiriva, Handyhaler, Respimat)		Inhaler ☐ 1 Nebulizer ☐ 2 Both ☐ 3 N/A ☐ 4	

Brown/ Red Wine **Orange**	**<u>3.2 Inhaled corticosteroids (strength)</u>** 6. Beclometasone (Aerobec, Asmabec, Beclazone, Becloforte, Becodisks, Becotide, Beclometasone Cyclocaps, Easy Haler Beclometasone, Beclazone Easibreathe, Clenil Modulate, Qvar, Qvar Easibreathe) 7. Budesonide (Budesonide Cyclocaps, Easy Haler Budesonide, Novolizer, Pulmicort) 8. Ciclesonide (Alvesco) 9. Fluticasone (Flixotide, Flixotide accuhaler, Flixotide evohaler, Flixotide disk haler) 10. Mometasone (Asmanex)		Inhaler ☐ [1] Nebulizer ☐ [2] Both ☐ [3] N/A ☐ [4]	
Purple **Red** **White/Orange**	**<u>Compound inhalers (strength)</u>** 11. Salmeterol & Fluticasone (Seretide, Seretide evohaler, Seretide accuhaler) 12. Formoterol and Budesonide (Symbicort, Symbicort turbohaler) 13. Formoterol and beclometasone (Fostair)			
	Tablets			
	Oral corticosteroids (strength e.g. 5mg x 1) 16. Prednisolone (Delta cortril) 17. Betamethasone (Betnelan, Benesol) 18. Cortisone 19. Deflazacort (Calcort) 20. Dexamethasone (Dexsol) 21. Methylprednisolone (Medrone)			Long ☐ [1] Short ☐ [2]
	Theophyllins 22. Theophylline (Nuelin, Slo-Phyllin, Uniphyllin) 23. Aminophylline (Phyllo continus)			

	Mucolytics 24. Carbocisteine (Mucodine) 25. Erdosteine (Erdotin) 26. Mecysteine (Visclair) 27. Dornase alfa (Pulmozyme) 28. Sodium chloride nebuliser solution (Muco Clear)			
	Oral antibiotics 29. Name of drug R if patient has supply in reserve			
Other	30. Other medications (Please specify)			

Oxygen:	Frequency of use:
30. Cylinder: 31. Concentrator:	

32. Inhaler technique

Correct ☐[1] Incorrect ☐[2] N/A ☐[3]

33. If incorrect:

a) Did not shake ☐[1]
b) Did not inhale correctly ☐[2]
c) Pressed inhaler twice consecutively ☐[3]
d) Did not hold breath in after inhaling ☐[4]

SECTION B: SMOKING

34. Have you ever smoked cigarettes, cigars or a pipe?

No ☐[0] Yes ☐[1]

35. If yes

Please say which

Cigarettes ☐[1]
Cigars ☐[2]
Pipe ☐[3]
Other ☐[4]

36. How old were you when you started to smoke regularly?

37. <u>If cigarettes</u>

Do you smoke cigarettes at all nowadays?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

38. About how many cigarettes a day do you usually smoke?

<u>If cigars</u>

39. Do you smoke cigars nowadays?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

40. About how many cigars do you usually smoke in a week?

<u>If pipe</u>

41. Do you smoke a pipe at all nowadays?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

<u>If they did smoke, but do not nowadays</u>

42. About how many cigarettes did you smoke in a day OR cigars did you smoke in a week when you smoked them regularly?

43. How long ago did you give up smoking cigarettes/cigars/a pipe regularly?

Less than 6 months ago	☐1
6 months but less than a year ago	☐2
1 year but less than 2 years ago	☐3
2 years but less than 5 years ago	☐4
5 years but less than 10 years ago	☐5
10 years or more ago	☐6
N/A	☐7

SECTION C: *SMOKING CESSATION*

44. Has your GP or any other clinician (doctor/nurse/pharmacist) advised you to quit smoking?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

45. Have you made a serious attempt to stop smoking before?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

46. ***Have you ever been given a referral for smoking cessation?***

No ☐ 0 Yes ☐ 1 N/A ☐ 2

SECTION D: *HOSPITAL OUTPATIENT APPOINTMENTS*

47. Do you attend the hospital for your COPD?

No ☐ 0 Yes ☐ 1

If yes

48. Who do you see?

Chest Specialist ☐ 1 Nurse Specialist ☐ 2 Other ☐ 3 N/A ☐ 4

If not

49. Who do you see?

GP ☐ 1 Nurse ☐ 2 Private doctor ☐ 3 Other ☐ 4 N/A☐ 5

50. Do you have regular spirometry assessment?

Yes ☐ 1 No ☐ 2 N/A ☐ 3

51. When was the last time you had it?

1 month ago ☐ 1 3 months ago ☐ 2 6 months ago ☐ 3 More than 1 year ☐ 4

More than 2 years ☐ 5 More than 3 years ☐ 6 More than 5 years ☐ 7

Don't know/remember ☐ 8

52. How often do you have spirometry?

Every six months ☐ [1] Once a year ☐ [2] Every two years ☐ [3] When necessary ☐ [4]

53. When was the last time you attended the hospital?

In the last week	☐ [1]
In the last month	☐ [2]
Three months ago	☐ [3]
In the last six months	☐ [4]
In the last year	☐ [5]
In the last two years	☐ [6]
N/A	☐ [7]
Awaiting first hospital consultation	☐ [8]
More than two years	☐ [9]

54. How frequently do you attend the hospital?

Once a month	☐ [1]
Once every three months	☐ [2]
Less than every three months	☐ [3]
N/A	☐ [4]
Don't Know	☐ [5]
Every 6 months	☐ [6]

SECTION E: *PULMONARY REHABILITATION*

55. Have you ever heard of pulmonary rehabilitation?

No ☐ [0] Yes ☐ [1]

56. Who informed you about pulmonary rehabilitation?

GP ☐ [1] Nurse ☐ [2] Other ☐ [3] N/A ☐ [4]

57. Have you ever been referred for pulmonary rehabilitation for your COPD?

No ☐ [0] Yes ☐ [1]

58. Have you attended pulmonary rehabilitation for your COPD?

No ☐ [0] Yes ☐ [1]

If yes

59. If yes, when was the last time you attended pulmonary rehabilitation?

In the last week	☐ 1
In the last month	☐ 2
Three months ago	☐ 3
In the last six months	☐ 4
In the last year	☐ 5
More than a year ago	☐ 6
N/A	☐ 7

60. Have you completed pulmonary rehabilitation for your COPD?

No ☐ 0 Yes ☐ 1 N/A ☐ 3

61. What are the benefits of attending pulmonary rehabilitation?

Obtaining information on COPD	Yes	☐ 1	No	☐ 0
Meeting other people with your condition	Yes	☐ 1	No	☐ 0
Learning about your COPD	Yes	☐ 1	No	☐ 0
Feeling confident	Yes	☐ 1	No	☐ 0
Becoming fitter	Yes	☐ 1	No	☐ 0
Feeling better	Yes	☐ 1	No	☐ 0
Other	Yes	☐ 1	No	☐ 0
N/A		☐ 3		

62. Were there any problems with attending pulmonary rehabilitation?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

If yes

63. What were these problems?

……

If attended >1 year ago or not at all

64. Would you be interested in attending pulmonary rehabilitation (again)?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

SECTION F: *ACUTE EXACERBATIONS & HOSPITAL ADMISSIONS*

Thinking now about the last time you experienced an exacerbation when you were very unwell with your COPD (an exacerbation is when your chest is worse with breathlessness and cough)

65. Have you ever had an acute exacerbation where you have experienced extreme breathlessness (worsening of airways disease that lasted longer than 1-2 days)?

No ☐ 0 Yes ☐ 1

If yes

When was the last time you felt very unwell with your breathing? ☐ (months)

66. About how many times has this happened in the last two years? ☐

67. Do the exacerbations vary in intensity?

No ☐ 0 Yes ☐ 1 Occasionally ☐ 2 N/A ☐ 3

68. Do you get any warning signs?

No ☐ 0 Yes ☐ 1 Occasionally ☐ 2 N/A ☐ 3

69. Where did your last exacerbation (severe attack of breathlessness) happen?

At home ☐ 1 At work ☐ 2 In the street ☐ 3 Other ☐ 4 N/A ☐ 5

70. What did you do when your last exacerbation happened?

a) Waited and saw what happened ☐ [1]
b) Rested ☐ [2]
c) Took more inhalers ☐ [3]
d) Took oral steroids (prednisolone) ☐ [4]
e) Took oxygen ☐ [5]
f) Took antibiotics ☐ [6]
g) Contacted your GP ☐ [7]
h) Called the ambulance ☐ [8]
i) Other ☐ [9]
j) N/A ☐ [10]
k) Went to hospital ☐ [11]

71. Can I confirm whether you were admitted to hospital for your acute exacerbation?

No ☐ [0] Yes ☐ [1] N/A ☐ [2]

72. If yes, why did you go to hospital? **……**……

73. How many times have you been in the past 3 months? ……..

74. How many nights have you spent in a general ward? ……..

75. How many nights have you spent in an Intensive Care Unit (ICU/ITU)? ……..

76. What treatment did you have in hospital when you were admitted?

a) Oxygen ☐ 1
b) Inhaler ☐ 2
c) Non-invasive ventilation (Nippy) ☐ 3
(This is where a mask is put tightly on your face and a machine helps you to breathe with air under pressure)
d) Ventilator ☐ 4
(This is where you are given an anaesthetic and a machine does the breathing for you)
e) Morphine ☐ 5
f) Nebuliser ☐ 6
g) Other ☐ 7
h) Don't know ☐ 8
i) N/A ☐ 9

77. Did you receive the treatment and help you required?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

78. Did it relieve your breathing problems?

No ☐ 0 Yes ☐ 1 Partially ☐ 2 N/A ☐ 3

SECTION G: This group of questions asks about your airways disease in the past 3 months. Please put a tick in the box which best applies to you.

79. In the past 3 months, how many times have you consulted with a doctor or nurse in the surgery because of airways disease? (apart from repeat prescriptions)

never ☐ 0
once ☐ 1
twice ☐ 2
three or more ☐ 3

80. **In the <u>past 3 months,</u> how many times has a doctor visited you at home because of airways disease?**

never	☐ 0
once	☐ 1
twice	☐ 2
three or more	☐ 3

81. **In the <u>past 3 months,</u> how many times have you been to the hospital outpatients department because of airways disease?**

never	☐ 0
once	☐ 1
twice	☐ 2
three or more	☐ 3

82. **In the <u>past 3 months,</u> how many times have you been admitted to hospital because of airways disease?**

never	☐ 0
once	☐ 1
twice	☐ 2
three or more	☐ 3

SECTION H: COST OF AIRWAYS DISEASE

83. In the <u>past 3 months,</u> have you paid for any airways disease medicines (including inhalers and tablets)?

Please tick <u>all</u> that apply

No, I did not have any medicines ☐ 1

No, I get free prescriptions ☐ 2

No, I used someone else's medicine ☐ 3

Yes, I have a pre-payment certificate ☐ 4

Yes, I pay for prescriptions each time I get them ☐ 5

I have paid £…….. for prescriptions in the past 3 month

Yes, I bought medicine without a prescription ☐ 6

I have paid £…….. for medicine *(e.g. cough medicine, homeopathic and herbal medicine)* without a prescription in the past 3 months

84. Please describe the last journey you made to the hospital or to your GP surgery because of your airways disease

The last time you went to the hospital

a) How did you get there? Walk ☐ 1 Drive ☐ 2 Other ☐ 3 N/A ☐ 4

b) If <u>you</u> had to pay anything to get there, how much did it cost <u>you</u>?

£ ……

The last time you went to your GP surgery

c) How did you get there? Walk ☐ 1 Drive ☐ 2 Other ☐ 3 N/A ☐ 4

d) If <u>you</u> had to pay anything to get there, how much did it cost <u>you</u>?

£ ……..

85. Did you have to make special arrangements at home the last time you went to the hospital or the GP surgery because of your airways disease? *(e.g. to take care of children or relatives who are elderly, disable or ill)*

No ☐ 0 Yes ☐ 1

Please describe ……

86. Did you or anyone else have to pay for these arrangements when you last went to the hospital or GP surgery? *(e.g. paying for a baby-sitter)*

No ☐ 0 Yes ☐ 1 N/A ☐ 2

How much altogether? £ ……..

87. Did anyone go with you or come and visit you when you last went to the hospital or GP surgery?

No ☐ 0 Yes ☐ 1 N/A ☐ 2

88. If yes, did they have to take time off work?

Yes ☐ 1 How many hours altogether? ……. hours

No ☐ 0

Not working ☐ 3

N/A ☐ 4

89. Have they lost any pay because of this time off work?

Yes ☐ 1

No ☐ 0

Don't know ☐ 3

N/A ☐ 4

SECTION I: *SOCIODEMOGRAPHIC*

It will help us to understand your answers better if we have a little background information from everyone:

Gender

Female ☐ 1 Male ☐ 2

b) May I ask your age? ☐

Are you

Married or living with a partner	☐ 1
Divorced or separated	☐ 2
Widowed	☐ 3
Or single (not now married and not now living with a partner)	☐ 4

90. Including yourself, how many people live in your household who are aged 18 or over? ☐

91. To which of the following ethnic groups would you say you belong?

White English	☐ 1
Black – Caribbean	☐ 2
Black – African	☐ 3
Black – other black groups	☐ 4
Indian	☐ 5
Pakistani	☐ 6
Bangladeshi	☐ 7
Chinese	☐ 8
Other	☐ 9

92. Which of the following best describes your main activity?

Retired from paid work	☐ 1
Unable to work (due to illness)	☐ 2
Unemployed	☐ 3
In paid work (full / part time)	☐ 4
Looking after the family, home or dependants	☐ 5
Student	☐ 6
Other ……..	☐ 7

93. Have you ever been in paid employment or self-employed

No ☐ 0 Yes ☐ 1

94. Please give the title of your present or most recent job

……

95. In that job are/were you

A manager	☐ 1
A foreman or supervisor	☐ 2
An employee (other than manager or foreman)	☐ 3
Self employed	☐ 4

96. Is this, or has this been your main job, if not what was your previous job?

……

97. Did your education continue after the minimum school leaving age (16 years)?

No ☐ 0 Yes ☐ 1

98. Do you have a degree or equivalent qualification?

No ☐ 0 Yes ☐ 1

99. Living arrangements:

Own home	Rented home	Home of relative	Other
☐[1]	☐ [2]	☐ [3]	☐ [4]

100. Are you currently receiving any financial benefits because of your condition?

1) Attendance allowance	No ☐ [0]	Yes ☐ [1]
2) Income support	No ☐ [0]	Yes ☐ [1]
3) Housing benefit	No ☐ [0]	Yes ☐ [1]
4) Statutory sick pay	No ☐ [0]	Yes ☐ [1]
5) Incapacity benefit	No ☐ [0]	Yes ☐ [1]
6) Council tax benefit	No ☐ [0]	Yes ☐ [1]
7) Employment allowance	No ☐ [0]	Yes ☐ [1]
8) Support allowance	No ☐ [0]	Yes ☐ [1]
9) Disability living allowance	No ☐ [0]	Yes ☐ [1]
10) State pension	No ☐ [0]	Yes ☐ [1]
11) Occupational pension	No ☐ [0]	Yes ☐ [1]
12) Pension Credit	No ☐ [0]	Yes ☐ [1]
13) Other benefit	No ☐ [0]	Yes ☐ [1]

Please say what:……

101. Do you have any financial problems at the moment (everyday life)?

No ☐ [0] Yes ☐ [1]

Appendix D3 – Quality of Life (QoL): Chronic Respiratory Questionnaire – Standardised (CRQ-SAS)

McMaster University
Canada

Chronic Respiratory Questionnaire

Self-Administered Standardized Format (CRQ-SAS)

First Administration

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For inquiries please contact austinp@mcmaster.ca or schuneh@mcmaster.ca

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CHRONIC RESPIRATORY QUESTIONNAIRE -SAS- FIRST ADMINISTRATION 1(10)

This questionnaire is designed to find out how you have been feeling during the last 2 weeks. In the first section, you will be asked to answer questions about activities which make some people feel short of breath. In the next section, you will answer questions about your mood and how you have been feeling.

Please read these instructions for completing this questionnaire:

- Please read each question carefully and then place an "x" in the box beside the answer that best describes you. If you are unsure about how to answer a question, please give the best answer you can. If you would like to change an answer, put a line through the box you want to change. Place an "x" in the box beside the option you would like to choose instead.
- There are no right or wrong answers.
- Your answers to this questionnaire will be kept confidential.

Please continue on the next page.

CHRONIC RESPIRATORY QUESTIONNAIRE - SELF ADMINISTERED - STANDARDIZED ACTIVITIES - "CRQ-SAS"

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 2(10)

Below is a list of activities which make some people with lung problems feel short of breath.

For each of the items below, place an "x" in the box that best describes how much shortness of breath you have had while doing that activity during the LAST 2 WEEKS.

The last column has been provided for you to indicate if you have NOT DONE an activity during the last two weeks.

(Place an "x" in one box on each line)

	ACTIVITIES:	Extremely short of breath	Very short of breath	Quite a bit short of breath	Moderate shortness of breath	Some shortness of breath	A little shortness of breath	Not at all short of breath	Not Done
1	Feeling emotional such as angry or upset	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
2	Taking care of your basic needs (bathing, showering, eating or dressing)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
3	Walking	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
4	Performing chores (such as housework, shopping, groceries)	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8
6	Participating in social activities	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6	☐ 7	☐ 8

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION -SA3(10)

These next questions ask you about your energy in general and how your mood has been during the **LAST 2 WEEKS**. Please put an "x" in a box, from 1 to 7, that best describes how you have felt.

6. In general, how much of the time during the **LAST 2 WEEKS** have you felt frustrated or impatient?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

7. How often during the **LAST 2 WEEKS** did you have a feeling of fear or panic when you had difficulty getting your breath?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 4(10)

8. What about fatigue? How tired have you felt over the **LAST 2 WEEKS?**

1. Extremely tired ☐
2. Very tired ☐
3. Quite a bit of tiredness ☐
4. Moderately tired ☐ (Place an "x" in one box only)
5. Somewhat tired ☐
6. A little tired ☐
7. Not at all tired ☐

9. How often during the **LAST 2 WEEKS** have you felt embarassed by your coughing or heavy breathing?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ -SAS 1ST ADMINISTRATION 5(10)

10. In the **LAST 2 WEEKS**, how much of the time did you feel very confident and sure that you could deal with your illness?

1. None of the time ☐
2. A little of the time ☐
3. Some of the time ☐
4. A good bit of the time ☐
5. Most of the time ☐
6. Almost all of the time ☐
7. All of the time ☐

(Place an "x" in one box only)

11. How much energy have you had in the **LAST 2 WEEKS**?

1. No energy at all ☐
2. A little energy ☐
3. Some energy ☐
4. Moderately energetic ☐
5. Quite a bit of energy ☐
6. Very energetic ☐
7. Full of energy ☐

(Place an "x" in one box only)

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 6(10)

12. In general, how much of the time did you feel upset, worried, or depressed during the **LAST 2 WEEKS**?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

(Place an "x" in one box only)

13. How often during the **LAST 2 WEEKS** did you feel you had complete control of your breathing problems?

1. None of the time ☐
2. A little of the time ☐
3. Some of the time ☐
4. A good bit of the time ☐
5. Most of the time ☐
6. Almost all of the time ☐
7. All of the time ☐

(Place an "x" in one box only)

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 7(10)

14. How much of the time during the **LAST 2 WEEKS** did you feel relaxed and free of tension?

1. None of the time ☐
2. A little of the time ☐
3. Some of the time ☐
4. A good bit of the time ☐
5. Most of the time ☐
6. Almost all of the time ☐
7. All of the time ☐

(Place an "x" in one box only)

15. How often during the **LAST 2 WEEKS** have you felt low in energy?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

(Place an "x" in one box only)

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 8(10)

16. In general, how often during the **LAST 2 WEEKS** have you felt discouraged or down in the dumps?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

17. How often during the **LAST 2 WEEKS** have you felt worn out or sluggish?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 9(10)

18. How happy, satisfied, or pleased have you been with your personal life during the **LAST 2 WEEKS**?

1. Very dissatisfied, unhappy most of the time ☐
2. **Generally dissatisfied, unhappy** ☐
3. Somewhat dissatisfied, unhappy ☐
4. **Generally satisfied, pleased** ☐ (Place an "x" in one box only)
5. Happy most of the time ☐
6. Very happy most of the time ☐
7. Extremely happy, could not be more satisfied or pleased ☐

19. How often during the **LAST 2 WEEKS** did you feel upset or scared when you had difficulty getting your breath?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

Please continue to the next page

Date ☐☐ ☐☐ ☐☐☐☐
DAY MONTH YEAR

CRQ-SAS 1ST ADMINISTRATION 10(10)

20. In general, how often during the **LAST 2 WEEKS** have you felt restless, tense, or uptight?

1. All of the time ☐
2. Most of the time ☐
3. A good bit of the time ☐
4. Some of the time ☐ (Place an "x" in one box only)
5. A little of the time ☐
6. Hardly any of the time ☐
7. None of the time ☐

THANK YOU

Appendix D4 – Quality of Life (QoL): Hospital Depression and anxiety Scale (HADS)

Hospital Anxiety and Depression Scale (HADS)

Patient ID:.....

We are aware that emotions play an important part in most illnesses. Knowing how you feel will enable us to understand better how to help people with your condition.

This questionnaire is designed to help us know how you feel. Read each item below and underline the reply which comes closest to how you have been feeling in the past week.

Don't take too long over your replies, your immediate reaction to each item will probably be more accurate than a long thought-out response.

I feel tense or 'wound up'

Most of the time

A lot of the time

From time to time, occasionally

Not at all

I feel as if I am slowed down

Nearly all the time

Very often

Sometimes

Not at all

I still enjoy the things I used to enjoy

Definitely as much

Not quite so much

Only a little

Hardly at all

I get a sort of frightened feeling li 'butterflies' in the stomach

Not at all

Occasionally

Quite often

Very often

I get a sort of frightened feeling something awful is about to happen

Very definitely and quite badly

Yes, but not too badly

A little, but it doesn't worry me

Not at all

I have lost interest in my appearance

Definitely

I don't take as much care as I should

I may not take quite as much care

I take just as much care as ever

I can laugh and see the funny side things

As much as I always could

Not quite so much now

Definitely not so much now

Not at all

I feel restless as if I have to be on t move

Very much indeed

Quite a lot

Not very much

Not at all

Worrying thoughts go through my mind

A great deal of the time

A lot of the time

Not too often

Very little

I look forward with enjoyment things

As much as I ever did

Rather less than I used to

Definitely less than I used to

Hardly at all

I feel cheerful

Never

Not often

Sometimes

Most of the time

I get sudden feelings of panic

Very often indeed

Quite often

Not very often

Not at all

I can sit at ease and feel relaxed

Definitely

Usually

Not often

Not at all

I can enjoy a good book or radio television programme

Often

Sometimes

Not often

Very seldom

Appendix D5 – Quality of Life / Disease Severity: Medical Research Council Dyspnoea Scale (MRC Dyspnoea Scale)

MRC dyspnoea scale

Medical Research Council dyspnoea scale for grading the degree of a patient's breathlessness

Patient ID:.....

Please tick the box with the option that applies to you:

1. Not troubled by breathlessness except on strenuous exercise ☐

2. Short of breath when hurrying or walking up a slight hill ☐

3. Walks slower than contemporaries on the level because of breathlessness, or has to stop for breath when walking at own pace ☐

4. Stops for breath after about 100 m or after a few minutes on the level ☐

5. Too breathless to leave the house, or breathless when dressing or undressing ☐

Appendix D6 – Illness Perceptions: Illness Perceptions Questionnaire – Revised (IPQ-R) – adapted for COPD

YOUR VIEWS ABOUT YOUR AIRWAYS DISEASE

Patient ID:.....

Listed below are a number of symptoms that you may or may not have experienced since your airways disease. Please indicate by circling *Yes* or *No,* whether you have experienced any of these symptoms since your airways disease, and whether you believe that these symptoms are related to your airways disease.

	I have experienced this symptom *since my airways disease*		This symptom is *related to my airways disease*	
Pain	Yes	No	Yes	No
Sore Throat	Yes	No	Yes	No
Nausea	Yes	No	Yes	No
Breathlessness	Yes	No	Yes	No
Weight Loss	Yes	No	Yes	No
Fatigue	Yes	No	Yes	No
Stiff Joints	Yes	No	Yes	No
Sore Eyes	Yes	No	Yes	No
Wheeziness	Yes	No	Yes	No
Headaches	Yes	No	Yes	No
Upset Stomach	Yes	No	Yes	No
Sleep Difficulties	Yes	No	Yes	No
Dizziness	Yes	No	Yes	No
Loss of Strength	Yes	No	Yes	No
Increase in weight	Yes	No	Yes	No

We are interested in your own personal views of how you now see your current airways disease. Please indicate how much you agree or disagree with the following statements about your airways disease by ticking the appropriate box.

	VIEWS ABOUT YOUR AIRWAYS DISEASE	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP1	My airways disease will last a short time					
IP2	My airways disease is likely to be permanent rather than temporary					
IP3	My airways disease will last for a long time					
IP4	This airways disease will pass quickly					
IP5	I expect to have this airways disease for the rest of my life					
IP6	My airways disease is a serious condition					
IP7	My airways disease has major consequences on my life					
IP8	My airways disease does not have much effect on my life					
IP9	My airways disease strongly affects the way others see me					
IP10	My airways disease has serious financial consequences					

	VIEWS ABOUT YOUR AIRWAYS DISEASE	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP11	My airways disease causes difficulties for those who are close to me					
IP12	There is a lot which I can do to control my symptoms					
IP13	What I do can determine whether my airways disease gets better or worse					
IP14	The course of my airways disease depends on me					
IP15	Nothing I do will affect my airways disease					
IP16	I have the power to influence my airways disease					
IP17	My actions will have no effect on the outcome of my airways disease					
IP18	My airways disease will improve in time					
IP19	There is very little that can be done to improve my airways disease					
IP20	My treatment will be effective in curing my airways disease					
IP21	The negative effects of my airways disease can be prevented (avoided) by my treatment					

	VIEWS ABOUT YOUR AIRWAYS DISEASE	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP22	My treatment can control my airways disease					
IP23	There is nothing which can help my condition					
IP24	The symptoms of my condition are puzzling to me					
IP25	My airways disease is a mystery to me					
IP26	I don't understand my airways disease					
IP27	My airways disease doesn't make any sense to me					
IP28	I have a clear picture or understanding of my condition					
IP29	The symptoms of my airways disease change a great deal from day to day					
IP30	My symptoms come and go in cycles					
IP31	My airways disease is very unpredictable					
IP32	I go through cycles in which my airways disease gets better and worse					
IP33	I get depressed when I think about my airways disease					

	VIEWS ABOUT YOUR AIRWAYS DISEASE	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
IP34	When I think about my airways disease I get upset					
IP35	My airways disease makes me feel angry					
IP36	My airways disease does not worry me					
IP37	Having this airways disease makes me feel anxious					
IP38	My airways disease makes me feel afraid					

CAUSES OF MY AIRWAYS DISEASE

We are interested in what you consider may have been the cause of your airways disease. As people are very different, there is no correct answer for this question. We are most interested in your own views about the factors that caused your airways disease rather than what others including doctors or family may have suggested to you. Below is a list of possible causes for your airways disease. Please indicate how much you agree or disagree that they were causes for you by ticking the appropriate box.

	POSSIBLE CAUSES	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
C1	Stress or worry					
C2	Hereditary – it runs in my family					
C3	A germ or virus					
C4	Diet or eating habits					
C5	Chance or bad luck					
C6	Poor medical care in my past					

	POSSIBLE CAUSES	STRONGLY DISAGREE	DISAGREE	NEITHER AGREE NOR DISAGREE	AGREE	STRONGLY AGREE
C7	Pollution in the environment					
C8	My own behaviour					
C9	My mental attitude e.g. thinking about life negatively					
C10	Family problems or worries					
C11	Overwork					
C12	My emotional state e.g. feeling down, lonely, anxious, empty					
C13	Ageing					
C14	Alcohol					
C15	Smoking					
C16	Accident or injury					
C17	My personality					
C18	Altered immunity					

Please list in rank-order the three most important factors that you now believe caused <u>YOUR airways disease</u>. You may use any of the items from the box above, or you may have additional ideas of your own.

The most important causes for me:

1. _____

2. _____

3. _____

Appendix D7 – General Self-Efficacy (GSE): General Self-Efficacy Scale

General Self-Efficacy Scale (GSE)

Patient Code:.....

Please tick one of the boxes according to how the statement applies to you

	Not at all true	Hardly true	Moderately true	Exactly true
	1	2	3	4
I can always manage to solve difficult problems if I try hard enough.				
If someone opposes me, I can find the means and ways to get what I want.				
It is easy for me to stick to my aims and accomplish my goals.				
I am confident that I could deal efficiently with unexpected events.				
Thanks to my resourcefulness, I know how to handle unforeseen situations.				
I can solve most problems if I invest the necessary effort.				
I can remain calm when facing difficulties because I can rely on my coping abilities.				
When I am confronted with a problem, I can usually find several solutions.				
If I am in trouble, I can usually think of a solution.				
I can usually handle whatever comes my way.				

Appendix D8 – Social Capital: Social Capital Questionnaire including demographics and SES information questions based on the 2001National Census

Patient ID:.....

Social Capital Questionnaire

In the following questions **please circle the most appropriate response 1, 2, 3 or 4**

1. Do you feel valued by society?

No, not much *Yes, very much*

1 2 3 4

2. If you were to die tomorrow, would you be satisfied with what your life has meant?

No, not much *Yes, very much*

1 2 3 4

3. Have you ever picked up other people's rubbish in a public place?

No, never *Yes, frequently*

1 2 3 4

4. Some say that by helping others you help yourself in the long run. Do you agree?

No, not much *Yes, very much*

1 2 3 4

5. Do you help out a local group as a volunteer?

No, not at all *Yes, often (at least once a week)*

1 2 3 4

6. Do you feel safe walking down your street after dark?

No, not much *Yes, very much*

1 2 3 4

7. Do you agree that most people can be trusted?

No, not much *Yes, very much*

1 2 3 4

8. If someone's car breaks down outside your house, do you invite them into your home to use the phone?

No, not at all *Yes, definitely*

1 **2** **3** **4**

9. Can you get help from friends when you need it?

No, not at all *Yes, definitely*

1 **2** **3** **4**

10. Does your area have a reputation for being a safe place?

No, not at all *Yes*

1 **2** **3** **4**

11. If you were caring for a child and needed to go out for a while, would you ask a neighbour for help?

No, not at all *Yes, definitely*

1 **2** **3** **4**

12. Have you visited a neighbour in the past week?

No, not at all *Yes, frequently*

1 **2** **3** **4**

13. Have you attended a local community event in the past 6 months (e.g. church fete, school concert, craft exhibition)?

No, not at all *Yes, several (at least 3)*

1 **2** **3** **4**

14. Are you an active member of a local organisation or club (e.g. sport, craft, social club)?

No, not at all *Yes, very active*

1 **2** **3** **4**

15. Does your local community feel like home?

No, not at all *Yes, definitely*

1 **2** **3** **4**

16. In the past week, how many phone conversations have you had with friends?

None *Many (at least 6)*

1 **2** **3** **4**

17. How many people did you talk to yesterday?

None at all *Many (at least 10)*

1 **2** **3** **4**

18. Over the weekend do you have lunch/dinner with other people outside your household?

No, not much *Yes, nearly always*

1 **2** **3** **4**

19. Do you go outside your local community to visit your family?

No, not much *Yes, nearly always*

1 **2** **3** **4**

20. When you go shopping in your local area are you likely to run into friends and acquaintances?

No, not much *Yes, nearly always*

1 **2** **3** **4**

21. If you need information to make a life decision, do you know where to find that information?

No, not at all *Yes, definitely*

1 **2** **3** **4**

22. In the past 6 months, have you done a favour for a sick neighbour?

No, not at all *Yes, frequently (at least 5 times)*

1 **2** **3** **4**

23. Are you on a management committee or organising committee for any local group or organisation?

No, not at all *Yes, several (at least 3)*

1 **2** **3** **4**

24. In the past 3 years, have you ever joined a local community action to deal with an emergency?

No, not at all *Yes, frequently (at least 5 times)*

1 **2** **3** **4**

25. In the past 3 years have you ever taken part in a local community project or working bee?

No, not at all *Yes, very much*

1 **2** **3** **4**

26. Have you ever been part of a project to organise a new service in your area (e.g. youth club, scout hall, child care, recreation for disabled)?

No, not at all *Yes, several times (at least 3)*

1 **2** **3** **4**

27. If you disagree with what everyone else agreed on, would you feel free to speak out?

No, not at all *Yes, definitely*

1 **2** **3** **4**

28. If you have a dispute with your neighbours (e.g. over fences or dogs) are you willing to seek mediation?

No, not at all *Yes, definitely*

1 **2** **3** **4**

29. Do you think that multiculturalism makes life in your area better?

No, not at all *Yes, definitely*

1 **2** **3** **4**

30. Do you enjoy living among people of different life styles?

No, not at all *Yes, definitely*

1 **2** **3** **4**

31. If a stranger, someone different, moves into your street, would they be accepted by the neighbours?

No, not easily *Yes, definitely*

1 **2** **3** **4**

The following five questions are for those in paid employment. If you are <u>not</u> in paid employment, please go to <u>Question 37.</u>

32. Do you feel part of the local geographic community where you work?

No, not at all *Yes, definitely*

1 **2** **3** **4**

33. Are your workmates also your friends?

No, not at all *Yes, definitely*

1 **2** **3** **4**

34. Do you feel part of a team at work?

No, not at all *Yes, definitely*

1 **2** **3** **4**

35. At work do you take the initiative to do what needs to be done even if no one asks you to?

No, not at all *Yes, definitely*

1 2 3 4

36. In the past week at work, have you helped a workmate even though it was not in your job description?

No, not at all *Yes, several times (at least 5)*

1 2 3 4

YOURSELF

In the following questions please tick the most appropriate response (or write in the correct answer in the questions with dots .....).

37. What is your gender? [ ] 1. Female[ ] 2. Male

38. Are you employed? [ ] Yes If yes, how many hours per week .....

Occupation: .....

[ ] No

39. What is your age in years? ..... years

40. What is the Postcode of your address? ..... postcode

41. Are you living in:

[ ] 1. Private house, flat, unit
[ ] 2. Public housing
[ ] 3. Other

42. Are you renting your accommodation?

[ ] 1. Yes
[ ] 2. No

43. How long have you lived in your local area?..... years

44. Who do you live with?

[ ] 1. alone
[ ] 2. just partner
[ ] 3. just children
[ ] 4. partner and children
[ ] 5. extended or blended family
[ ] 6. friends
[ ] 7. other

45. Do you have children under 18 years of age?

[ ] Yes

If yes, How many under school age .....
How many school age to 18 .....

[ ] No

46. What language do you prefer to speak at home?

[ ] English
[ ] Other

47. Which ethnic group do you belong to?

[ ] 1. White British
[ ] 2. White other
[ ] 3. Black Caribbean
[ ] 4. Black African
[ ] 5. Black other
[ ] 6. Bangladeshi
[ ] 7. Indian
[ ] 8. Pakistani
[ ] 9. Asian other
[ ] 10. Chinese
[ ] 11. None of these

48. What is the main source of income for your household?

[ ] 1. Wages or salary
[ ] 2. Pension or benefit
[ ] 3. Other

49. What is your current weekly total household income before taxes and deductions? *Please tick one*

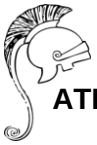
[ ] 1. £0 - £244 (£12688 per year)
[ ] 2. £244 - £339 (£12688 – £17628 per year)
[ ] 3. £340 - £451 (£17680 – £23452 per year)
[ ] 4. £452 - £625 (£23504 – £32500 per year)
[ ] 5. £626 or more (£32552 or more per year)

50. What are your qualifications?

[ ] 1. Primary School completed
[ ] 2. Secondary school completed or equivalent
[ ] 3. Certificate or Diploma
[ ] 4. Degree
[ ] 5. Postgraduate qualification

Appendix D9: Participant study debrief

Debrief



ATHENA project: Access To HEalthcare iN Airways disease

Thank you for taking the time to take part in this study!

This research is investigating your experience of your chest condition and how social and financial issues may influence your healthcare services and your quality of life.

Remember, your results will be kept confidential and anonymous.

Appendix E: Research Ethics Committee Approval & Amendment Documents

Miss Sofia Georgopoulou
Department of Primary Care & Public Health Sciences
King's College London
9th Floor,
Capital House
42 Weston Street
London
SE1 3QD

01/09/2010

Dear Miss Georgopoulou,

Project Title: Associations between socioeconomic deprivation and illness perceptions in the access to healthcare and outcome of disease in COPD patients

R & D Reference: RDLSou562

Thank you for your assistance providing the documentation for the scrutiny of this project.

I am satisfied that this study meets with the requirements of the Research Governance Framework. It has been approved by the research lead for the respective NHS organisation.

Approval is given on behalf of NHS Lambeth and Southwark on the understanding that you adhere to the conditions on the attached document. The end date of the project is listed as **19/01/2012.**

If you require any further information, please contact Ali Alshukry on 020 7525 0264.

Yours sincerely

Dr Anne Grant
RG & M Manager
South East London NHS
Bexley, Bromley, Greenwich, Lambeth, Lewisham & Southwark

East London REC 3

REC Offices Block A,
South House
Royal Free Hospital
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Miss Sofia Georgopoulou PhD Student
King's College London
Division of Health & Social Care Capital House, 9th Floor
42 Weston Street SE1 3QD

01 March 2011

Dear Miss Georgopoulou

Study title: Associations between socioeconomic deprivation and illness perceptions in the access to healthcare and outcome of disease in COPD patients
REC reference: 10/H0701/62
Amendment number: 02
Amendment date: 04 February 2011

Ethical opinion

The members of the Committee taking part in the review gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Questionnaire	2	04 February 2011
Notice of Substantial Amendment (non-CTIMPs)	02	04 February 2011

Membership of the Committee

The members of the Committee who took part in the review are listed on the attached sheet.

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

10/H0701/62: Please quote this number on all correspondence

Yours sincerely

Atul Patel

Committee Co-ordinator

E-mail: atul.patel@imperial.nhs.uk

Enclosures:List of names and professions of members who took part in the review

Copy to:

Sponsor:
Mr Keith Brennan, R&D Department, King's College London

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42 Weston Street
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Appendix F: Unadjusted analyses

Appendix F1: Unadjusted analyses examining associations between SES and Quality of Life (QoL)

Table F1a Associations between SES (IMD score) and QoL – unadjusted for disease severity (Pearson's correlations)

	Dyspnoea	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
IMD scores	r= -0.01 (p=0.90)	r= -0.04 (p=0.65)	r= -0.10 (p=0.17)	r= -0.04 (p=0.61)	r= 0.08 (p=0.32)	r= 0.09 (p=0.25)

Table F1b Differences in QoL according to SES (IMD quintiles) – unadjusted for disease severity (analyses of variance - ANOVA)

SES measure	**QoL**					
IMD quintiles	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	5.34 (0.14)	4.05 (0.16)	4.86 (0.14)	5.51 (0.15)	5.81 (0.47)	4.42 (0.42)
2	5.15 (0.18)	4.01 (0.19)	4.88 (0.17)	5.60 (0.19)	5.79 (0.59)	4.33 (0.52)
3	5.42 (0.29)	4.41 (0.32)	5.29 (0.28)	6.02 (0.32)	4.86 (0.98)	3.52 (0.86)
4 (least deprived)	5.14 (0.51)	4.39 (0.56)	5.02 (0.49)	4.89 (0.55)	5.14 (1.69)	3.57 (1.49)
F and p values	F(3, 172)=0.34; p=0.79	F(3, 172)= 0.49; p=0.69	F(3, 172)=0.68; p=0.57	F(3, 172)=1.24; p=0.30	F(3, 172)=0.31; p=0.82	F(3, 172)=0.37; p=0.78

Table F1c Differences in QoL according to SES (income level) – unadjusted for disease severity (analyses of variance - ANOVA)

SES measure	**QoL**					
Income Level	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	4.99 (0.15)	3.71 (0.16)	4.54 (0.14)	5.18 (0.16)	6.65 (0.50)	5.39 (0.43)
2	5.36 (0.16)	4.31 (0.17)	5.21 (0.15)	5.71 (0.17)	4.73 (0.54)	3.60 (0.47)
3 (least deprived)	5.85 (0.23)	4.61 (0.26)	5.26 (0.22)	6.31 (0.25)	5.19 (0.79)	2.81 (0.68)
F and p values	F(2, 173)=4.96; p=0.008	F(2, 173)=5.60; p=0.004	F(2, 173)=6.55; p=0.002	F(2, 173)=7.58; p=0.001	F(2, 173)=3.70; p=0.03	F(2, 173)=6.68; p=0.002

Table F1d Differences in QoL according to SES (educational level) – unadjusted for disease severity (analyses of variance - ANOVA)

SES measure	**QoL**					
Income Level	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
1 (pre-secondary)	5.22 (1.33)	4.13 (1.52)	4.88 (1.38)	5.58 (1.48)	5.57 (4.98)	4.45 (4.11)
2 (post-secondary)	5.36 (1.33	4.05 (1.39)	4.99 (1.16)	5.57 (1.44)	5.79 (3.58)	3.97 (3.66)
F and p values	F(1, 174)= 0.49; p= 0.48	F(1, 174)= 0.11; p= 0.74	F(1, 174)= 0.31; p= 0.58	F(1, 174)= 0.004; p= 0.95	F(1, 174)= 0.11; p= 0.75	F(1, 174)= 0.62; p= 0.43

Table F1e Differences in QoL according to SES (occupational level) – unadjusted for disease severity (analyses of variance - ANOVA)

SES measure	**QoL**					
Occupational Class	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (high)	5.27 (0.21)	3.91 (0.24)	4.78 (0.21)	5.60 (0.24)	6.05 (0.71)	4.62 (0.63)
2 (medium)	5.13 (0.22)	4.19 (0.24)	5.30 (0.21)	5.55 (0.24)	4.40 (0.72)	3.08 (0.63)
3 (low)	5.35 (0.13)	4.13 (0.15)	4.84 (0.13)	5.58 (0.15)	6.00 (0.44)	4.56 (0.39)
F and p values	F(2, 173)=0.37; p=0.69	F(2, 173)=0.42; p=0.66	F(2, 173)=2.09; p=0.13	F(2, 173)=0.01; p=0.99	F(2, 173)=2.01; p=0.14	F(2, 173)=2.19; p=0.12

Appendix F2: Unadjusted analyses examining associations between co-morbidities and Quality of Life (QoL)

Table F2a Differences in QoL according to co-morbidities – unadjusted for disease severity (ANOVA)

	QoL					
Co-morbidities	**Dyspnoea**	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
No	5.55 (0.20)	4.61 (0.21)	5.10 (0.19)	5.62 (0.22)	5.64 (0.66)	3.89 (0.59)
Yes	5.19 (0.12)	3.92 (0.13)	4.87 (0.11)	5.56 (0.13)	5.67 (0.39)	4.37 (0.34)
F and p values	F(1, 174)=2.45; p=0.12	F(1, 174)= 7.63; p=0.006	F(1, 174)=1.07; p=0.30	F(1, 174)=0.05; p=0.83	F(1, 174)=0.001; p=0.97	F(1, 174)=0.51; p=0.48

Appendix F3: Unadjusted analyses examining associations between SES and psychosocial variables (illness perceptions)

Table F3a Relationship between SES (IMD score) and illness perceptions – unadjusted for disease severity (Pearson's r correlations)

	Identity	**Timeline**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
IMD Scores	r= 0.07; p=0.37	r= -0.06; p=0.44	r= 0.02; p=0.83	r= -0.08; p=0.32	r= -0.04; p=0.60	r= -0.04; p=0.57	r= 0.03; p=0.66	r= -0.03; p=0.67

Table F3b Differences in illness perceptions according to SES (IMD quintiles) – unadjusted for disease severity (analyses of variance - ANOVA)

	Illness Perceptions							
IMD quintiles	**Identity**	**Timeline**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	3.77 (0.24)	3.77 (0.07)	2.86 (0.07)	3.41 (0.08)	3.22 (0.05)	3.67 (0.07)	2.89 (0.08)	2.55 (0.08)
2	4.00 (0.30)	3.97 (0.09)	2.91 (0.09)	3.39 (0.09)	3.20 (0.06)	3.57 (0.09)	2.90 (0.11)	2.54 (0.10)
3	3.05 (0.50)	3.85 (0.14)	2.84 (0.15)	3.75 (0.16)	3.28 (0.11)	3.86 (0.15)	2.74 (0.17)	2.64 (0.16)
4 (least deprived)	3.43 (0.87)	3.45 (0.25)	2.76 (0.27)	3.62 (0.27)	3.46 (0.18)	3.83 (0.26)	2.96 (0.30)	2.79 (0.28)
F and p values	F(3, 172)=0.92; p=0.43	F(3, 172)=1.91; p=0.13	F(3, 172)=0.14; p=0.94	F(3, 172)=1.57; p=0.20	F(3, 172)=0.67; p=0.58	F(3, 172)=1.13; p=0.34	F(3, 172)=0.26; p=0.86	F(3, 172)=0.33; p=0.81

Table F3c Differences in illness perceptions according to SES (income level) – unadjusted for disease severity (analyses of variance - ANOVA)

	Illness Perceptions							
Income Level	**Identity**	**Timeline**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	4.13 (0.26)	3.78 (0.08)	3.05 (0.08)	3.34 (0.08)	3.16 (0.05)	3.65 (0.08)	2.96 (0.09)	2.67 (0.08)
2	3.70 (0.28)	3.91 (0.08)	2.78 (0.08)	3.41 (0.09)	3.19 (0.06)	3.56 (0.08)	2.92 (0.10)	2.55 (0.09)
3 (least deprived)	2.87 (0.41)	3.78 (0.12)	2.63 (0.12)	3.81 (0.13)	3.48 (0.09)	3.92 (0.12)	2.56 (0.14)	2.35 (0.13)
F and p values	F(2, 173)=3.40; p=0.04	F(2, 173)=0.81; p=0.45	F(2, 173)=5.35; p=0.006	F(2, 173)=5.13; p=0.007	F(2, 173)=5.15; p=0.007	F(2, 173)=3.24; p=0.04	F(2, 173)=3.16; p=0.05	F(2, 173)=2.25; p=0.11

Table F3d Differences in illness perceptions according to SES (educational level) – unadjusted for disease severity (analyses of variance - ANOVA)

	Illness Perceptions							
Educational Level	**Identity**	**Timeline**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
1 (pre-secondary)	3.60 (2.18)	3.85 (0.54)	2.87 (0.69)	3.36 (0.75)	3.13 (0.46)	3.61 (0.70)	2.91 (0.80)	2.61 (0.73)
2 (post-secondary)	3.95 (2.49)	3.81 (0.80)	2.88 (0.73)	3.58 (0.65)	3.37 (0.49)	3.74 (0.63)	2.83 (0.79)	2.50 (0.72)
F and p values	F(1, 174)= 0.94; p= 0.33	F(1, 174)= 0.17; p= 0.68	F(1, 174)= 0.009; p= 0.93	F(1, 174)= 4.39; p= 0.04	F(1, 174)= 11.27; p= 0.001	F(1, 174)= 1.52; p= 0.22	F(1, 174)= 0.36; p= 0.55	F(1, 174)= 1.03; p= 0.31

Table F3e Differences in illness perceptions according to SES (occupational class) – unadjusted for disease severity (analyses of variance - ANOVA)

	Illness Perceptions							
Occupational Class	**Identity**	**Timeline**	**Consequences**	**Personal Control**	**Treatment Control**	**Illness Coherence**	**Timeline Cyclical**	**Emotional Representations**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (high)	4.15 (0.37)	3.83 (0.11)	2.82 (0.11)	3.37 (0.12)	3.22 (0.08)	3.57 (0.11)	2.82 (0.13)	2.65 (0.12)
2	3.29 (0.37)	3.93 (0.11)	2.95 (0.11)	3.44 (0.12)	3.27 (0.08)	3.82 (0.11)	2.85 (0.13)	2.51 (0.12)
3 (low)	3.76 (0.23)	3.80 (0.07)	2.87 (0.07)	3.49 (0.07)	3.22 (0.05)	3.64 (0.07)	2.91 (0.08)	2.56 (0.07)
F and p values	F(2, 173)=1.36; p=0.26	F(2, 173)=0.58; p=0.56	F(2, 173)=0.33; p=0.72	F(2, 173)=0.36; p=0.70	F(2, 173)=0.19; p=0.83	F(2, 173)=1.38; p=0.25	F(2, 173)=0.19; p=0.83	F(2, 173)=0.39; p=0.68

Appendix F4: Unadjusted analyses examining associations between SES and psychosocial variables (self-efficacy)

Table F4a Relationship between SES (IMD score) and general self-efficacy (GSE) – unadjusted for disease severity (Pearson's correlations)

SES measures	Self-efficacy (GSE)
IMD Score	r= 0.03 (p=0.67)

Table F4b Differences in general self-efficacy (GSE) according to SES (IMD quintiles) – unadjusted for disease severity (analysis of variance – ANOVA)

SES measure	GSE
IMD quintiles	Mean (SE)
1 (most deprived)	3.24 (0.06)
2	3.40 (0.08)
3	3.25 (0.13)
4 (least deprived)	3.06 (0.22)
F and p values	F(3, 172)=1.31; p=0.27

Table F4c Differences in general self-efficacy (GSE) according to SES (income level) – unadjusted for disease severity (analysis of variance – ANOVA)

SES measure	**GSE**
Income Level	Mean (SE)
1 (most deprived)	3.22 (0.07)
2	3.26 (0.07)
3 (least deprived)	3.51 (0.11)
F and p values	F(2, 173)=2.89; p=0.06

Table F4d Differences in general self-efficacy (GSE) according to SES (educational level) – unadjusted for disease severity (analysis of variance – ANOVA)

SES measure	**GSE**
Income Level	Mean (SD)
1 (pre-secondary)	3.22 (0.61)
2 (post-secondary)	3.38 (0.55)
F and p values	F(1, 174)= 2.82; p= 0.10

Table F4e Differences in general self-efficacy (GSE) according to SES (occupational class) – unadjusted for disease severity (analysis of variance – ANOVA)

SES measure	**GSE**
Occupational Class	Mean (SE)
1 (high)	3.26 (0.09)
2 (medium)	3.51 (0.09)
3 (low)	3.21 (0.06)
F and p values	F(2, 173)=3.65; p=0.03

Appendix F5: Unadjusted analyses examining associations between SES and psychosocial variables (social capital)

Table F5a Relationship between SES and Social Capital (Pearson's correlations)

SES measures	Participation in Local Community	Social Agency/Proactivity	Trust and Safety	Neighbourhood Connections	Family & Friends	Tolerance of Diversity	Value of Life	Work Connections
IMD Scores	r= -0.09 (p=0.13)	r= -0.17 (p=0.01)	r= -0.26 (p<0.001)	r= -0.18 (p=0.03)	r= -0.28 (p<0.001)	r= -0.12 (p=0.10)	r= -0.001 (p=0.89)	r= -0.15 (p=0.47)

Table F5b Differences in social capital according to SES (IMD quintiles) – unadjusted for disease severity (analysis of variance – ANOVA)

	Social Capital							
IMD quintiles	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	1.36 (0.07)	2.83 (0.06)	2.26 (0.07)	2.54 (0.08)	2.46 (0.07)	2.76 (0.08)	2.74 (0.09)	2.86 (0.39)
2	1.44 (0.09)	3.02 (0.08)	2.63 (0.09)	2.75 (0.10)	2.83 (0.09)	3.07 (0.09)	2.85 (0.12)	2.67 (0.39)
3	1.46 (0.15)	3.20 (0.13)	2.59 (0.15)	2.72 (0.17)	2.95 (0.14)	3.14 (0.16)	2.91 (0.19)	3.78 (0.60)
4 (least deprived)	1.67 (0.25)	3.13 (0.23)	2.60 (0.27)	2.97 (0.29)	3.05 (0.25)	2.91 (0.27)	2.64 (0.33)	4.00 (1.04)
F and p values	F(3, 172)=0.59; p=0.62	F(3, 172)=2.88; p=0.04	F(3, 172)=4.02; p=0.009	F(3, 172)=1.32; p=0.27	F(3, 172)=6.47; p<0.001	F(3, 172)=3.07; p=0.03	F(3, 172)=0.34; p=0.80	F(3, 14)=1.15; p=0.36

Table F5c Differences in social capital according to SES (income level) – unadjusted for disease severity (analysis of variance – ANOVA)

	Social Capital							
Income Level	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (most deprived)	1.38 (0.07)	2.83 (0.07)	2.28 (0.08)	2.57 (0.09)	2.54 (0.08)	2.84 (0.08)	2.58 (0.10)	1.00 (0.99)
2	1.28 (0.08)	2.96 (0.07)	2.53 (0.09)	2.72 (0.10)	2.62 (0.08)	2.90 (0.09)	2.96 (0.11)	3.00 (0.44)
3 (least deprived)	1.77 (0.12)	3.22 (0.11)	2.62 (0.13)	2.70 (0.14)	3.04 (0.12)	3.13 (0.13)	2.97 (0.16)	3.17 (0.28)
F and p values	F(2, 173)=6.40; p=0.002	F(2, 173)=4.96; p=0.008	F(2, 173)=3.42; p=0.04	F(2, 173)=0.70; p=0.50	F(2, 173)=6.55; p=0.002	F(2, 173)=1.80; p=0.17	F(2, 173)=4.15; p=0.02	F(2, 15)=2.23; p=0.14

Table F5d Differences in social capital according to SES (educational level) – unadjusted for disease severity (analysis of variance – ANOVA)

	Social Capital							
Occupational Class	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
1 (pre-secondary)	1.31 (0.58)	2.86 (0.61)	2.44 (0.76)	2.60 (0.81)	2.66 (0.66)	2.84 (0.68)	2.75 (0.91)	2.78 (1.15)
2 (post-secondary)	1.56 (0.75)	3.07 (0.57)	2.43 (0.66)	2.72 (0.74)	2.67 (0.72)	3.02 (0.77)	2.86 (0.83)	3.22 (0.96)
F and p values	F(1, 174)= 6.35; p= 0.01	F(1, 174)= 5.55; p= 0.02	F(1, 174)= 0.004; p= 0.95	F(1, 174)= 1.10; p= 0.30	F(1, 174)= 0.009; p= 0.93	F(1, 174)= 2.92; p= 0.09	F(1, 174)= 0.66; p= 0.42	F(1, 16)= 0.79; p= 0.39

Table F5e Differences in social capital according to SES (occupational class) – unadjusted for disease severity (analysis of variance – ANOVA)

	Social Capital							
Occupational Class	**Participation in Local Community**	**Social Agency/ Proactivity**	**Feelings of Trust & Safety**	**Neighbourhood Connections**	**Family & Friend Connections**	**Tolerance of Diversity**	**Value of Life**	**Work Connections**
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
1 (high)	1.33 (0.11)	2.90 (0.10)	2.37 (0.11)	2.57 (0.13)	2.64 (0.11)	2.85 (0.12)	2.63 (0.14)	2.56 (0.39)
2	1.30 (0.11)	3.16 (0.10)	2.67 (0.12)	2.76 (0.13)	2.90 (0.11)	3.11 (0.12)	2.96 (0.14)	3.87 (0.43)
3 (low)	1.48 (0.07)	2.89 (0.06)	2.37 (0.07)	2.64 (0.08)	2.58 (0.07)	2.87 (0.07)	2.79 (0.09)	2.76 (0.36)
F and p values	F(2, 173)=1.40; p=0.25	F(2, 173)=2.98; p=0.05	F(2, 173)=2.63; p=0.08	F(2, 173)=0.59; p=0.55	F(2, 173)=3.28; p=0.04	F(2, 173)=1.74; p=0.18	F(2, 173)=1.39; p=0.25	F(2, 15)=2.95; p=0.08

Appendix F6: Unadjusted analyses examining associations between psychosocial variables (illness perceptions) and health care access (HCA)

Table F6a Differences in HCA according to illness perceptions – unadjusted for disease severity (analysis of variance - ANOVA)

ANOVA	Smoking Referral (adjusted means & S.D.)	Consultant Referrals (adjusted means & S.D.)	Regular Spirometry (adjusted means & S.D.)	PR awareness (adjusted means & S.D.)
Identity	No: 3.68 (2.42)/Yes: 3.90 (2.37)	No: 3.54 (2.27)/Yes: 4.85 (2.27)	No: 3.80 (2.42)/Yes: 3.70 (2.24)	No: 3.30 (2.36)/Yes: 4.19 (2.18)
	F(1,140)= 0.31; p=0.58	F(1,174)= 7.61; p=0.006	F(1,174)= 0.08; p=0.78	F(1,174)= 6.87; p=0.008
Timeline	No: 3.94 (0.71)/Yes: 3.77 (0.61)	No: 3.83 (0.65)/Yes: 3.86 (0.72)	No: 3.77 (0.82)/Yes: 3.88 (0.51)	No: 3.63 (0.73)/Yes: 4.03 (0.51)
	F(1,140)= 2.26; p=0.14	F(1,174)= 0.05; p=0.83	F(1,174)= 1.22; p=0.27	F(1,174)=18.20; p<0.001
Consequences	No: 2.87 (0.79)/Yes: 2.91 (0.64)	No: 2.78 (0.67)/Yes: 3.38 (0.64)	No: 2.83 (0.71)/Yes: 2.90 (0.70)	No: 2.64 (0.65)/Yes: 3.11 (0.67)
	F(1,140)= 0.10; p=0.75	F(1,174)= 18.03; p<0.001	F(1,174)= 0.47; p=0.50	F(1,174)= 22.11; p<0.001
Pers. Control	No: 3.53 (0.73)/Yes: 3.49 (0.69)	No: 3.43 (0.73)/Yes: 3.55 (0.66)	No: 3.53 (0.68)/Yes: 3.39 (0.75)	No: 3.44 (0.71)/Yes: 3.46 (0.73)
	F(1,140)= 0.08; p=0.78	F(1,174)= 0.60; p=0.44	F(1,174)= 1.63; p=0.20	F(1,174)= 0.03; p=0.76
Treatm. Control	No: 3.25 (0.50)/Yes: 3.26 (0.49)	No: 3.21 (0.48)/Yes: 3.34 (0.52)	No: 3.20 (0.53)/Yes: 3.25 (0.45)	No: 3.32 (0.47)/Yes: 3.15 (0.49)
	F(1,140)= 0.000; p=0.99	F(1,174)= 1.64; 0.20	F(1,174)= 0.52; p=0.47	F(1,174)= 5.56; p=0.02
Illness Coher.	No: 3.67 (0.72)/Yes: 3.72 (0.63)	No: 3.65 (0.66)/Yes: 3.74 (0.77)	No: 3.66 (0.65)/Yes: 3.67 (0.70)	No: 3.59 (0.67)/Yes: 3.73 (0.67)
	F(1,140)= 0.17; p=0.68	F(1,174)= 0.43; p=0.51	F(1,174)= 0.01; p=0.91	F(1,174)= 1.87; p=0.24
Timeline Cycl.	No: 2.73 (0.83)/Yes: 2.95 (0.75)	No: 2.85 (0.79)/Yes: 2.99 (0.79)	No: 2.89 (0.79)/Yes: 2.87 (0.80)	No: 2.82 (0.82)/Yes: 2.93 (0.76)
	F(1,140)= 2.54; p=0.11	F(1,174)= 0.68; 0.41	F(1,174)= 0.01; p=0.91	F(1,174)= 0.82; p=0.22
Emotional Reps.	No: 2.40 (0.73)/Yes: 2.68 (0.70)	No: 2.53 (0.73)/Yes: 2.80 (0.64)	No: 2.46 (0.70)/Yes: 2.65 (0.74)	No: 2.46 (0.71)/Yes: 2.67 (0.72)
	F(1,140)= 5.03; p=0.03	F(1,174)= 3.38; p= 0.068	F(1,174)= 2.70; p=0.10	F(1,174)= 3.69; p=0.056

ANOVA	PR referral	PR attendance	PR completion	Hospital Admission
Identity	No: 3.44 (2.33)/Yes: 4.22 (2.21)	No: 3.62 (2.43)/Yes: 4.28 (2.21)	No: 4.60 (2.64)/Yes: 4.17 (2.06)	No: 3.73 (2.43)/Yes: 3.78 (2.00)
	F(1,174)= 4.87; p=0.02	F(1,68)= 0.93; p=0.34	F(1,55)= 0.42; p=0.52	F(1,174)= 0.02; p=0.89
Timeline	No: 3.70 (0.70)/Yes: 4.04 (0.52)	No: 3.90 (0.16)/Yes: 4.07 (0.56)	No: 4.02 (0.43)/Yes: 4.09 (0.61)	No: 3.87 (0.67)/Yes: 3.75 (0.62)
	F(1,174)= 11.87; p=0.001	F(1,68)= 1.20; p=0.28	F(1,55)= 0.15; p=0.70	F(1,174)= 1.10; p=0.29
Consequences	No: 2.68 (0.70)/Yes: 3.17 (0.60)	No: 3.04 (0.69)/Yes: 3.18 (0.59)	No: 3.46 (0.47)/Yes: 3.08 (0.60)	No: 2.82 (0.71)/Yes: 3.00 (0.67)
	F(1,174)= 22.30; p<0.001	F(1,68)= 0.56; p=0.46	F(1,55)= 4.78; p=0.03	F(1,174)= 2.43; p=0.14
Pers. Control	No: 3.46 (0.72)/Yes: 3.44 (0.72)	No: 3.41 (0.84)/Yes: 3.44 (0.70)	No: 3.31 (0.79)/Yes: 3.48 (0.67)	No: 3.45 (0.72)/Yes: 3.46 (0.72)
	F(1,174)= 0.03; p=0.98	F(1,68)= 0.01; p=0.91	F(1,55)= 0.64; p=0.43	F(1,174)= 0.02; p=0.85
Treatm. Control	No: 3.31 (0.49)/Yes: 3.11 (0.46)	No: 3.08 (0.44)/Yes: 3.11 (0.47)	No: 3.04 (0.36)/Yes: 3.13 (0.51)	No: 3.23 (0.49)/Yes: 3.24 (0.47)
	F(1,174)= 6.88; p=0.01	F(1,68)= 0.05; p=0.83	F(1,55)= 0.43; p=0.52	F(1,174)= 0.008; p=0.92
Illness Coher.	No: 3.60 (0.69)/Yes: 3.76 (0.64)	No: 3.66 (0.60)/Yes: 3.79 (0.65)	No: 3.43 (0.87)/Yes: 3.91 (0.50)	No: 3.67 (0.68)/Yes: 3.65 (0.67)
	F(1,174)= 2.50; p=0.19	F(1,68)= 0.40; p=0.53	F(1,55)= 6.87; p=0.001	F(1,174)= 0.02; p=0.85
Timeline Cycl.	No: 2.87 (0.80)/Yes: 2.88 (0.78)	No: 2.73 (0.76)/Yes: 2.90 (0.79)	No: 2.82 (0.78)/Yes: 2.93 (0.80)	No: 2.74 (0.78)/Yes: 3.21 (0.72)
	F(1,174)= 0.005; p=0.59	F(1,68)= 0.48; p=0.49	F(1,55)= 0.22; p=0.64	F(1,174)= 12.94; p<0.001
Emotional Reps.	No: 2.50 (0.76)/Yes: 2.67 (0.66)	No: 2.51 (0.61)/Yes: 2.69 (0.67)	No: 2.89 (0.67)/Yes: 2.62 (0.67)	No: 2.51 (0.74)/Yes: 2.71 (0.66)
	F(1,174)= 2.11; p=0.12	F(1,68)= 0.76; p=0.39	F(1,55)= 1.80; p=0.19	F(1,174)= 2.83

Table F6b Differences in treatment appropriateness according to illness perceptions – unadjusted for disease severity (ANOVA)

ANOVA	Over-treated (adjusted means & S.D.)	Appropriately Treated (adjusted means & S.D.)	Under-treated (adjusted means & S.D.)
Identity	No: 3.51 (2.15)/Yes: 4.18 (2.53)	No: 3.59 (2.30)/Yes: 3.91 (2.32)	No: 3.95 (2.41)/Yes: 3.19 (1.94)
	F(1,174)= 3.41; p=0.07	F(1,174)= 0.80; p=0.37	F(1,174)= 3.73; p=0.055
Timeline	No: 3.78 (0.73)/Yes: 3.93 (0.50)	No: 3.76 (0.71)/Yes: 3.91 (0.60)	No: 3.88 (0.63)/Yes: 3.71 (0.72)
	F(1,174)= 2.01; p=0.16	F(1,174)= 2.18; p=0.14	F(1,174)= 2.40; p=0.12
Consequences	No: 2.83 (0.72)/Yes: 2.95 (0.67)	No: 2.75 (0.70)/Yes: 3.00 (0.68)	No: 2.93 (0.68)/Yes: 2.71 (0.74)
	F(1,174)= 1.12; p=0.29	F(1,174)= 5.70; p=0.02	F(1,174)= 3.55; p=0.06
Personal Control	No: 3.40 (0.76)/Yes: 3.55 (0.63)	No: 3.47 (0.74)/Yes: 3.43 (0.71)	No: 3.47 (0.71)/Yes: 3.39 (0.74)
	F(1,174)= 1.67; p=0.20	F(1,174)= 0.17; p=0.68	F(1,174)= 0.51; p=0.48

ANOVA	Over-treated (adjusted means & S.D.)	Appropriately Treated (adjusted means & S.D.)	Under-treated (adjusted means & S.D.)
Treatment Control	No: 3.20 (0.54)/Yes: 3.29 (0.36)	No: 3.23 (0.54)/Yes: 3.23 (0.43)	No: 3.27 (0.46)/Yes: 3.11 (0.55)
	F(1,174)= 1.29; p=0.26	F(1,174)= 0.000; p=0.998	F(1,174)= 0.45; p=0.51
Illness Coherence	No: 3.66 (0.68)/Yes: 3.66 (0.68)	No: 3.62 (0.70)/Yes: 3.71 (0.65)	No: 3.71 (0.68)/Yes: 3.54 (0.66)
	F(1,174)= 0.004; p=0.95	F(1,174)= 0.92; p=0.34	F(1,174)= 2.26; p=0.13
Timeline Cyclical	No: 2.81 (0.75)/Yes: 2.99 (0.85)	No: 2.87 (0.78)/Yes: 2.89 (0.81)	No: 2.92 (0.80)/Yes: 2.76 (0.76)
	F(1,174)= 2.25; p=0.14	F(1,174)= 0.03; p=0.87	F(1,174)= 1.34; p=0.25
Emotional Representations	No: 2.49 (0.71)/Yes: 2.71 (0.73)	No: 2.54 (0.74)/Yes: 2.60 (0.71)	No: 2.62 (0.74)/Yes: 2.42 (0.68)
	F(1,174)= 3.71; p=0.056	F(1,174)= 0.24; p=0.62	F(1,174)= 2.63; p=0.11

Appendix F7: Unadjusted analyses examining associations between psychosocial variables (self-efficacy) and health care access (HCA)

Table F7a Differences in HCA according to self-efficacy – unadjusted for disease severity (analysis of variance - ANOVA)

ANOVA	Smoking Referral (adjusted means & S.D.)	Consultant Referrals (adjusted means & S.D.)	Regular Spirometry (adjusted means & S.D.)	PR awareness (adjusted means & S.D.)
Self-efficacy	No: 3.34 (0.50)/Yes: 3.26 (0.62)	No: 3.28 (0.60)/Yes: 3.33 (0.54)	No: 3.32 (0.55)/Yes: 3.27 (0.62)	No: 3.27 (0.62)/Yes: 3.30 (0.56)
	F(1,140)= 0.76; p=0.39	F(1,174)= 0.20; p=0.66	F(1,174)= 0.32; p=0.58	F(1,174)= 0.09; p=0.74
	PR referral (adjusted means and SD)	**PR attendance (adjusted means and SD)**	**PR completion (adjusted means and SD)**	**Hospital Admission (adjusted means and SD)**
Self-efficacy	No: 3.28 (0.63)/Yes: 3.29 (0.52)	No: 3.29 (0.61)/Yes: 3.27 (0.54)	No: 3.19 (0.56)/Yes: 3.33 (0.52)	No: 3.33 (0.59)/Yes: 3.22 (0.57)
	F(1,174)= 0.006; p=0.94	F(1,174)= 0.05; p=0.82	F(1, 61)= 0.91; p=0.34	F(1,171)= 1.24; p=0.27

Table F7b Differences in treatment appropriateness according to self-efficacy – unadjusted for disease severity (ANOVA)

ANOVA	Over-treated (adjusted means & S.D.)	Appropriately Treated (adjusted means & S.D.)	Under-treated (adjusted means & S.D.)
Self-efficacy	No: 3.30 (0.61)/Yes: 3.27 (0.57)	No: 3.25 (0.63)/Yes: 3.32 (0.55)	No: 3.31 (0.55)/Yes: 3.23 (0.70)
	F(1,174)= 0.07; p=0.79	F(1,174)= 0.55; p=0.46	F(1,174)= 0.56; p=0.46

Appendix F8: Unadjusted analyses examining associations between psychosocial variables (social capital) and health care access (HCA)

Table F8a Differences in HCA according to social capital – unadjusted for disease severity (analyses of variance - ANOVA)

ANOVA	Smoking Referral (adjusted means & S.D.)	Consultant Referrals (adjusted means & S.D.)	Regular Spirometry (adjusted means & S.D.)	PR awareness (adjusted means & S.D.)
Particip Local Com.	No: 1.43 (0.72)/Yes: 1.37 (0.59)	No: 1.43 (0.67)/Yes: 1.32 (0.64)	No: 1.47 (0.71)/Yes: 1.36 (0.63)	No: 1.40 (0.66)/Yes: 1.42 (0.66)
	F(1,140)= 0.24; p=0.63	F(1,174)= 0.63; p=0.43	F(1,174)= 1.14; p=0.29	F(1,174)= 0.05; p=0.77
Social Agency	No: 3.04 (0.64)/Yes: 2.94 (0.56)	No: 2.94 (0.61)/Yes: 2.99 (0.59)	No: 2.97 (0.56)/Yes: 2.93 (0.64)	No: 2.89 (0.61)/Yes: 3.00 (0.60)
	F(1,140)= 1.05; p=0.31	F(1,174)= 0.15; p=0.70	F(1,174)= 0.21; p=0.65	F(1,174)= 1.38; p=0.22
Trust & Safety	No: 2.46 (0.67)/Yes: 2.38 (0.74)	No: 2.44 (0.71)/Yes: 2.42 (0.76)	No: 2.45 (0.71)/Yes: 2.43 (0.72)	No: 2.48 (0.75)/Yes: 2.38 (0.69)
	F(1,140)= 0.54; p=0.46	F(1,174)= 0.009; p=0.92	F(1,174)= 0.03; p=0.86	F(1,174)= 0.85; p=0.45
Neighbourhood Conn.	No: 2.74 (0.76)/Yes: 2.61 (0.81)	No: 2.65 (0.80)/Yes: 2.63 (0.69)	No: 2.64 (0.80)/Yes: 2.66 (0.77)	No: 2.68 (0.81)/Yes: 2.62 (0.75)
	F(1,140)= 0.93; p=0.34	F(1,174)= 0.02; p=0.88	F(1,174)= 0.02; p=0.88	F(1,174)= 0.33; p=0.59
Friends & Family	No: 2.67 (0.66)/Yes: 2.65 (0.69)	No: 2.66 (0.68)/Yes: 2.64 (0.69)	No: 2.70 (0.70)/Yes: 2.63 (0.67)	No: 2.62 (0.68)/Yes: 2.70 (0.68)
	F(1,140)= 0.02; p=0.88	F(1,174)= 0.03; p=0.88	F(1,174)= 0.38; p=0.54	F(1,174)= 0.60; p=0.49
Tolerance of Diversity	No: 2.92 (0.70)/Yes: 2.98 (0.76)	No: 2.91 (0.72)/Yes: 2.95 (0.77)	No: 2.94 (0.69)/Yes: 2.89 (0.75)	No: 2.86 (0.76)/Yes: 2.97 (0.68)
	F(1,140)= 0.30; p=0.58	F(1,174)= 0.09; p=0.77	F(1,174)= 0.16; p=0.70	F(1,174)= 1.09; p=0.36
Value of Life	No: 2.97 (0.73)/Yes: 2.59 (0.95)	No: 2.82 (0.90)/Yes: 2.67 (0.72)	No: 2.85 (0.84)/Yes: 2.75 (0.90)	No: 2.88 (0.88)/Yes: 2.71 (0.87)
	F(1,140)= 6.77; p=0.01	F(1,174)= 0.66; p=0.42	F(1,174)= 0.63; p=0.43	F(1,174)= 1.56; p=0.19
Work Connections	No: 3.28 (1.12)/Yes: 2.91 (1.08)	No: 2.94 (1.06)/Yes: 4.00 (---)	No: 3.29 (0.79)/Yes: 2.77 (1.22)	No: 3.03 (1.15)/Yes: 2.94 (0.93)
	F(1, 15)= 0.44; p=0.52	F(1,16)= 0.95; p=0.40	F(1,16)= 1.11; p=0.31	F(1,116)= 0.02; p=0.84

	PR referral	PR attendance	PR completion	Hospital Admission
Particip Local Com.	No: 1.43 (0.69)/Yes: 1.38 (0.62)	No: 1.19 (0.48)/Yes: 1.41 (0.64)	No: 1.20 (0.56)/Yes: 1.49 (0.66)	No: 1.27 (0.55)/Yes: 1.49 (0.66)
	F(1,174)= 0.30	F(1,68)= 1.42; p=0.24	F(1,55)= 2.28; p=0.21	F(1,174)= 1.77; p=0.19
Social Agency	No: 2.93 (0.61)/Yes: 2.98 (0.60)	No: 2.90 (0.85)/Yes: 2.97 (0.56)	No: 2.84 (0.56)/Yes: 3.01 (0.56)	No: 2.89 (0.69)/Yes: 3.01 (0.56)
	F(1,174)= 0.26	F(1,68)= 0.14; p=0.71	F(1,55)= 2.28; p=0.14	F(1,174)= 0.55; p=0.47
Trust & Safety	No: 2.46 (0.77)/Yes: 2.39 (0.63)	No: 2.23 (0.58)/Yes: 2.41 (0.67)	No: 2.36 (0.62)/Yes: 2.42 (0.69)	No: 2.34 (0.62)/Yes: 2.42 (0.69)
	F(1,174)= 0.35	F(1,68)= 0.78; p=0.38	F(1,55)= 0.98; p=0.33	F(1,174)= 1.42; p=0.26
Neighbourhood Conn.	No: 2.64 (0.80)/Yes: 2.66 (0.75)	No: 2.37 (0.54)/Yes: 2.72 (0.78)	No: 2.44 (0.61)/Yes: 2.82 (0.81)	No: 2.47 (0.64)/Yes: 2.82 (0.81)
	F(1,174)= 0.04; p=0.81	F(1,68)= 2.37; p=0.13	F(1,55)= 0.10; p=0.75	F(1,174)= 2.74; p=0.10
Friends & Family	No: 2.62 (0.69)/Yes: 2.72 (0.67)	No: 2.67 (0.73)/Yes: 2.72 (0.67)	No: 2.69 (0.82)/Yes: 2.73 (0.61)	No: 2.65 (0.74)/Yes: 2.73 (0.61)
	F(1,174)= 0.99; p=0.38	F(1,68)= 0.06; p=0.80	F(1,55)= 2.72; p=0.11	F(1,174)= 1.29; p=0.27
Tolerance of Diversity	No: 2.87 (0.74)/Yes: 2.99 (0.69)	No: 2.85 (0.88)/Yes: 3.01 (0.64)	No: 2.96 (0.45)/Yes: 3.02 (0.70)	No: 2.92 (0.65)/Yes: 3.02 (0.70)
	F(1,174)= 1.15; p=0.36	F(1,68)= 0.57; p=0.45	F(1,55)= 0.04; p=0.84	F(1,174)= 0.005; p=0.91
Value of Life	No: 2.83 (0.88)/Yes: 2.74 (0.87)	No: 2.92 (0.91)/Yes: 2.68 (0.87)	No: 2.63 (0.72)/Yes: 2.69 (0.92)	No: 2.73 (0.79)/Yes: 2.69 (0.92)
	F(1,174)= 0.42; p=0.45	F(1,68)= 0.85; p=0.36	F(1,55)= 0.12; p=0.73	F(1,174)= 1.48; p=0.23
Work Connections	No: 2.98 (1.14)/Yes: 3.08 (0.83)	No: 3.00 (1.00)/Yes: 3.33 (---)	N/A	No: 3.08 (0.83)/Yes: --- (---)
	F(1,16)= 0.03; p=1.00	F(1,2)= 0.08; p=0.80	N/A	F(1,16)= 3.11; p=0.11

Table F8b Differences in treatment appropriateness according to social capital – unadjusted for disease severity (ANOVA)

ANOVA	Over-treated (adjusted means & S.D.)	Appropriately Treated (adjusted means & S.D.)	Under-treated (adjusted means & S.D.)
Particip Local Com.	No: 1.38 (0.60)/Yes: 1.47 (0.77)	No: 1.47 (0.70)/Yes: 1.35 (0.61)	No: 1.41 (0.68)/Yes: 1.42 (0.60)
	F(1,174)= 0.71; p=0.40	F(1,174)= 1.57; p=0.21	F(1,174)= 0.02; p=0.89
Social Agency	No: 2.93 (0.59)/Yes: 2.97 (0.64)	No: 2.92 (0.61)/Yes: 2.98 (0.61)	No: 2.98 (0.60)/Yes: 2.87 (0.61)
	F(1,174)= 0.14; p=0.71	F(1,174)= 0.49; p=0.49	F(1,174)= 1.10; p=0.30
Trust & Safety	No: 2.38 (0.71)/Yes: 2.53 (0.72)	No: 2.48 (0.72)/Yes: 2.39 (0.72)	No: 2.44 (0.70)/Yes: 2.42 (0.77)
	F(1,174)= 1.57; p=0.21	F(1,174)= 0.67; p=0.41	F(1,174)= 0.02; p=0.89
Neighbourhood Conn.	No: 2.63 (0.79)/Yes: 2.69 (0.78)	No: 2.65 (0.78)/Yes: 2.65 (0.79)	No: 2.69 (0.77)/Yes: 2.54 (0.81)
	F(1,174)= 0.30; p=0.59	F(1,174)= 0.000; p=0.99	F(1,174)= 1.37; p=0.24
Friends & Family	No: 2.58 (0.67)/Yes: 2.82 (0.68)	No: 2.62 (0.66)/Yes: 2.70 (0.71)	No: 2.72 (0.68)/Yes: 2.50 (0.66)
	F(1,174)= 5.15; p=0.02	F(1,174)= 0.59; p=0.44	F(1,174)= 3.47; p=0.06
Tolerance of Diversity	No: 2.86 (0.74)/Yes: 3.02 (0.68)	No: 2.92 (0.76)/Yes: 2.90 (0.69)	No: 2.95 (0.69)/Yes: 2.81 (0.81)
	F(1,174)= 1.97; p=0.16	F(1,174)= 0.04; p=0.85	F(1,174)= 1.34; p=0.25
Value of Life	No: 2.75 (0.92)/Yes: 2.87 (0.79)	No: 2.85 (0.85)/Yes: 2.74 (0.90)	No: 2.84 (0.84)/Yes: 2.66 (0.96)
	F(1,174)= 0.77; p=0.38	F(1,174)= 0.70; p=0.40	F(1,174)= 1.48; p=0.23
Work Connections	No: 2.94 (1.14)/Yes: 3.10 (0.98)	No: 2.97 (1.11)/Yes: 3.06 (1.02)	No: 3.20 (0.94)/Yes: 2.00 (1.20)
	F(1, 16)= 0.09; p=0.77	F(1,16)= 0.02; p=0.88	F(1,16)= 3.77; p=0.07

Appendix F9: Unadjusted analyses examining associations between psychosocial variables (illness perceptions) and quality of life (QoL)

Table F9a Relationship between illness perceptions and QoL – unadjusted for disease severity (Pearson's Correlations)

	Dyspnoea	Fatigue	Emotional Function	Mastery	Anxiety	Depression
Identity	r= -0.56 (p< 0.001)	r= -0.36 (p< 0.001)	r= -0.38 (p< 0.001)	r= -0.47 (p< 0.001)	r= 0.31 (p< 0.001)	r= 0.33 (p< 0.001)
Timeline	r= -0.21 (p= 0.006)	r= -0.04 (p= 0.63)	r= -0.02 (p= 0.80)	r= -0.05 (p= 0.50)	r= 0.02 (p= 0.79)	r= 0.12 (p= 0.13)
Consequences	r= -0.65 (p< 0.001)	r= -0.49 (p< 0.001)	r= -0.42 (p< 0.001)	r= -0.49 (p< 0.001)	r= 0.35 (p< 0.001)	r= 0.39 (p< 0.001)
Personal Control	r= 0.18 (p= 0.02)	r= 0.23 (p= 0.003)	r= 0.13 (p= 0.09)	r= 0.27 (p< 0.001)	r= -0.10 (p= 0.19)	r= -0.24 (p= 0.001)
Treatment Control	r= 0.20 (p= 0.009)	r= 0.14 (p= 0.07)	r= 0.15 (p= 0.05)	r= 0.16 (p= 0.04)	r= -0.05 (p= 0.48)	r= -0.31 (p< 0.001)
Illness Coherence	r= 0.11 (p= 0.16)	r= 0.18 (p= 0.02)	r= 0.18 (p= 0.02)	r= 0.21 (p= 0.005)	r= -0.26 (p< 0.001)	r= -0.17 (p= 0.02)
Timeline Cyclical	r= -0.22 (p= 0.003)	r= -0.30 (p< 0.001)	r= -0.22 (p= 0.003)	r= -0.23 (p= 0.002)	r= 0.26 (p< 0.001)	r= 0.15 (p= 0.05)
Emotional Representations	r= -0.40 (p< 0.001)	r= -0.38 (p< 0.001)	r= -0.49 (p< 0.001)	r= -0.53 (p< 0.001)	r= 0.52 (p< 0.001)	r= 0.35 (p< 0.001)

Appendix F10: Unadjusted analyses examining associations between psychosocial variables (self-efficacy) and quality of life (QoL)

Table F10a Relationship between self-efficacy and QoL – unadjusted for disease severity (Pearson's Correlations)

	Dyspnoea	**Fatigue**	**Emotional Function**	**Mastery**	**Anxiety**	**Depression**
Self-efficacy (	r= 0.12 (p= 0.13)	r= 0.24 (p= 0.001)	r= 0.33 (p< 0.001)	r= 0.41 (p< 0.001)	r= -0.28 (p< 0.001)	r= -0.40 (p< 0.001)

Appendix F11: Unadjusted analyses examining associations between psychosocial variables (social capital) and quality of life (QoL)

Table F11a Relationship between social capital and QoL – unadjusted for disease severity (Pearson's Correlations)

	Dyspnoea	Fatigue	Emotional Function	Mastery	Anxiety	Depression
Participation Local Com.	r= 0.07 (p= 0.37)	r= 0.05 (p= 0.52)	r= -0.01 (p= 0.85)	r= 0.05 (p= 0.48)	r= 0.13 (p= 0.10)	r= -0.09 (p= 0.22)
Social Agency/Proact.	r= -0.03 (p= 0.76)	r= 0.21 (p= 0.004)	r= 0.19 (p= 0.01)	r= 0.20 (p= 0.006)	r= -0.09 (p= 0.25)	r= -0.35 (p< 0.001)
Trust and Safety	r= 0.10 (p= 0.16)	r= 0.23 (p= 0.002)	r= 0.33 (p< 0.001)	r= 0.31 (p< 0.001)	r= -0.29 (p< 0.001)	r= -0.30 (p< 0.001)
Neighbourhood Con.	r= -0.07 (p= 0.38)	r= 0.05 (p= 0.48)	r= 0.17 (p= 0.02)	r= 0.16 (p= 0.03)	r= -0.09 (p= 0.26)	r= -0.30 (p< 0.001)
Family & Friends Con.	r= -0.06 (p= 0.40)	r= 0.16 (p= 0.04)	r= 0.09 (p= 0.23)	r= 0.13 (p= 0.09)	r= -0.03 (p= 0.70)	r= -0.26 (p= 0.001)
Tolerance of Diversity	r= -0.09 (p= 0.26)	r= 0.06 (p= 0.45)	r= 0.12 (p= 0.11)	r= 0.06 (p= 0.42)	r= -0.10 (p= 0.19)	r= -0.11 (p= 0.13)
Value of Life	r= 0.02 (p= 0.80)	r= 0.25 (p= 0.001)	r= 0.32 (p< 0.001)	r= 0.23 (p= 0.003)	r= -0.23 (p= 0.002)	r= -0.33 (p< 0.001)
Work Connections	r= -0.17 (p= 0.50)	r= 0.03 (p= 0.90)	r= 0.04 (p= 0.88)	r= -0.23 (p= 0.35)	r= -0.25 (p= 0.32)	r= -0.48 (p= 0.04)

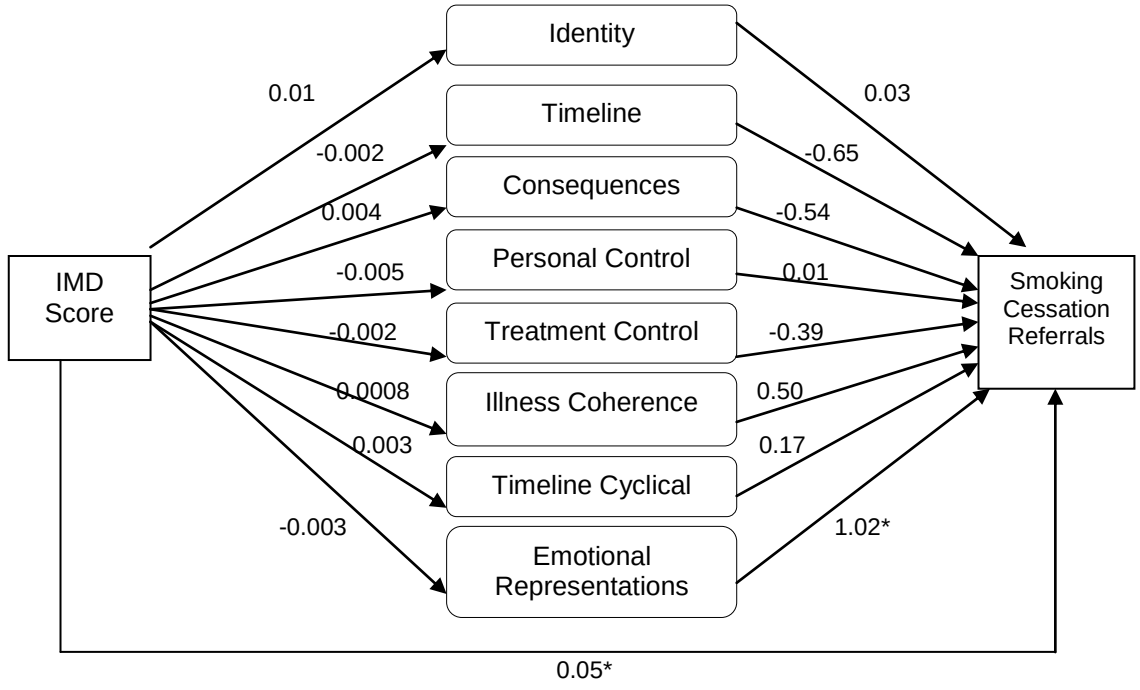
Appendix F12: Unadjusted mediation analyses examining illness perceptions, self-efficacy and social capital as mediators in the relationship between SES and HCA

Table F12a Direct, total and specific indirect effects of IMD score and illness perceptions on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.05	2.90	0.004	0.0171	0.0882

Indirect effects	Point estimate	Lower	Upper
Total	-0.001	-0.0182	0.0185
Specific indirect effects			
Identity	0.0003	-0.0049	0.0077
Timeline	0.002	-0.0100	0.0135
Consequences	-0.002	-0.0137	0.0060
Personal Control	-0.0001	-0.0052	0.0051
Treatment Control	0.0008	-0.0065	0.0068
Illness Coherence	0.0004	-0.0050	0.0075
Timeline Cyclical	0.0005	-0.0041	0.0062
Emotional Representations	-0.003	-0.0194	0.0117

Figure F12a Multiple mediation analysis examining the relationship between IMD score and HCA (smoking cessation referrals) mediated by illness perceptions in COPD

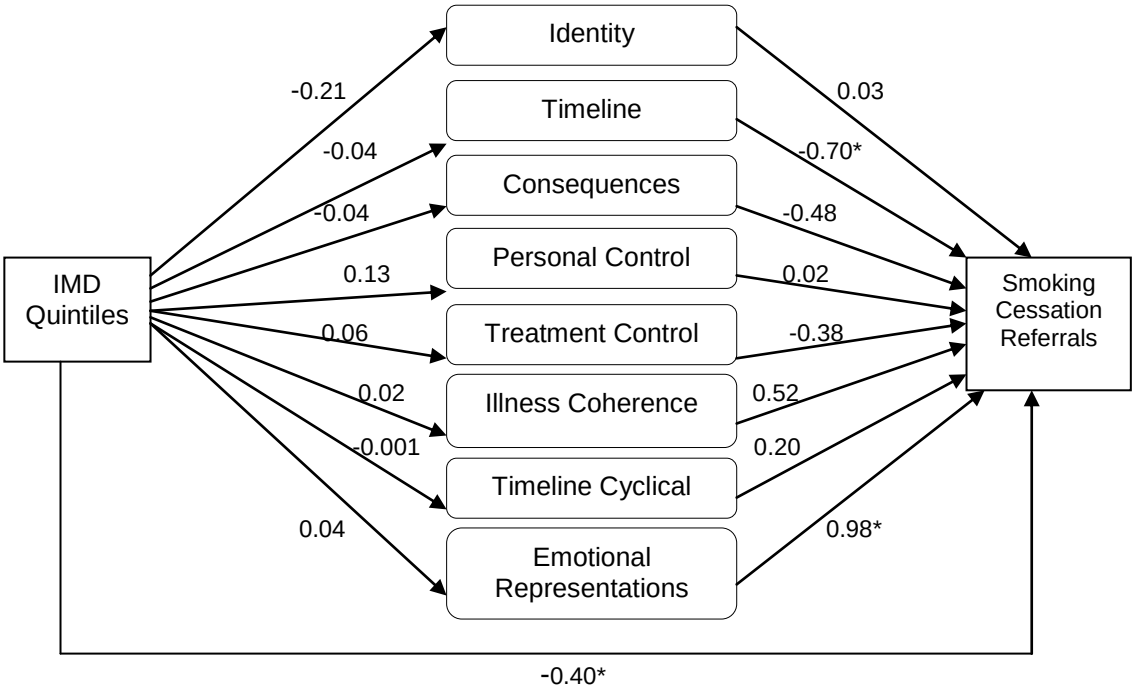


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12b Direct, total and specific indirect effects of IMD quintiles and illness perceptions on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.53	-2.32	0.02	-0.9698	-0.0811
Indirect effects	Point estimate			Lower	Upper
Total	0.07			-0.1576	0.3493
Specific indirect effects					
Identity	-0.005			-0.1264	0.0468
Timeline	0.03			-0.0729	0.2525
Consequences	0.02			-0.0461	0.1920
Personal Control	0.003			-0.0910	0.1121
Treatment Control	-0.02			-0.1848	0.0373
Illness Coherence	0.008			-0.0676	0.1095
Timeline Cyclical	-0.0003			-0.0746	0.0634
Emotional Representations	0.04			-0.1057	0.2741

Figure F12b Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by illness perceptions in COPD



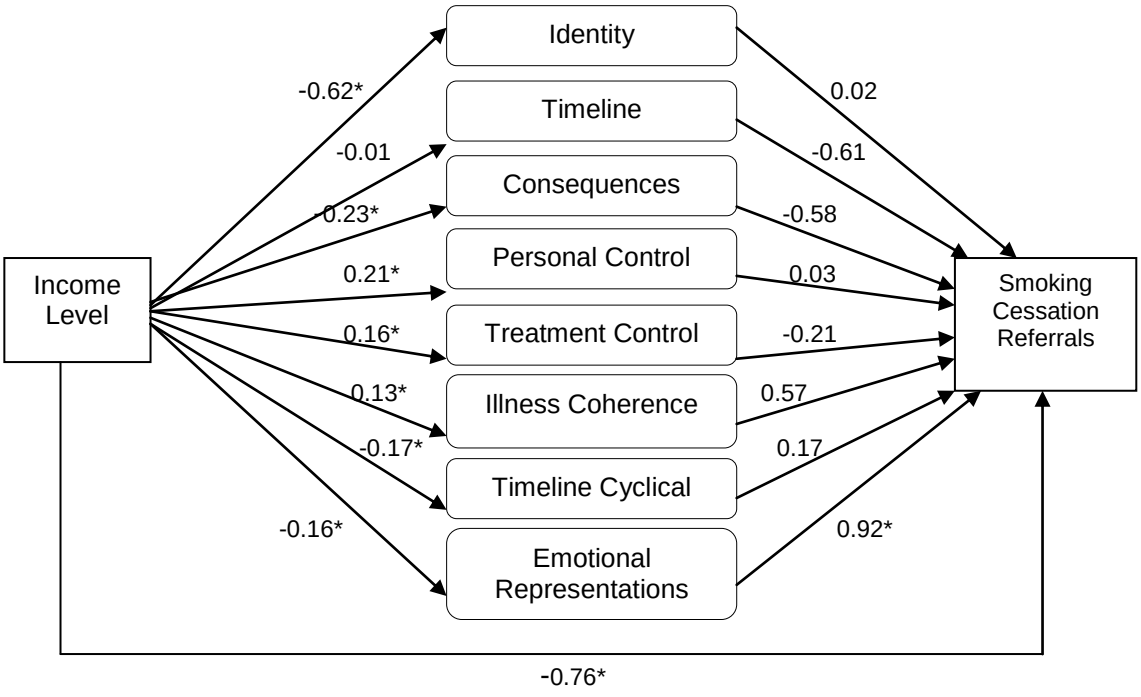
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12c Direct, total and specific indirect effects of income level and illness perceptions on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.76	-2.87	0.004	-1.2831	-0.2407

Indirect effects	Point estimate	Lower	Upper
Total	-0.006	-0.2963	0.3257
Specific indirect effects			
Identity	-0.01	-0.2046	0.1235
Timeline	0.008	-0.1070	0.1800
Consequences	0.13	-0.0680	0.4128
Personal Control	0.007	-0.1631	0.1677
Treatment Control	-0.03	-0.2494	0.1321
Illness Coherence	0.07	-0.0037	0.2151
Timeline Cyclical	-0.03	-0.1916	0.0639
Emotional Representations	-0.15	-0.5106	0.0045

Figure F12c Multiple mediation analysis examining the relationship between income level and HCA (smoking cessation referrals) mediated by illness perceptions in COPD



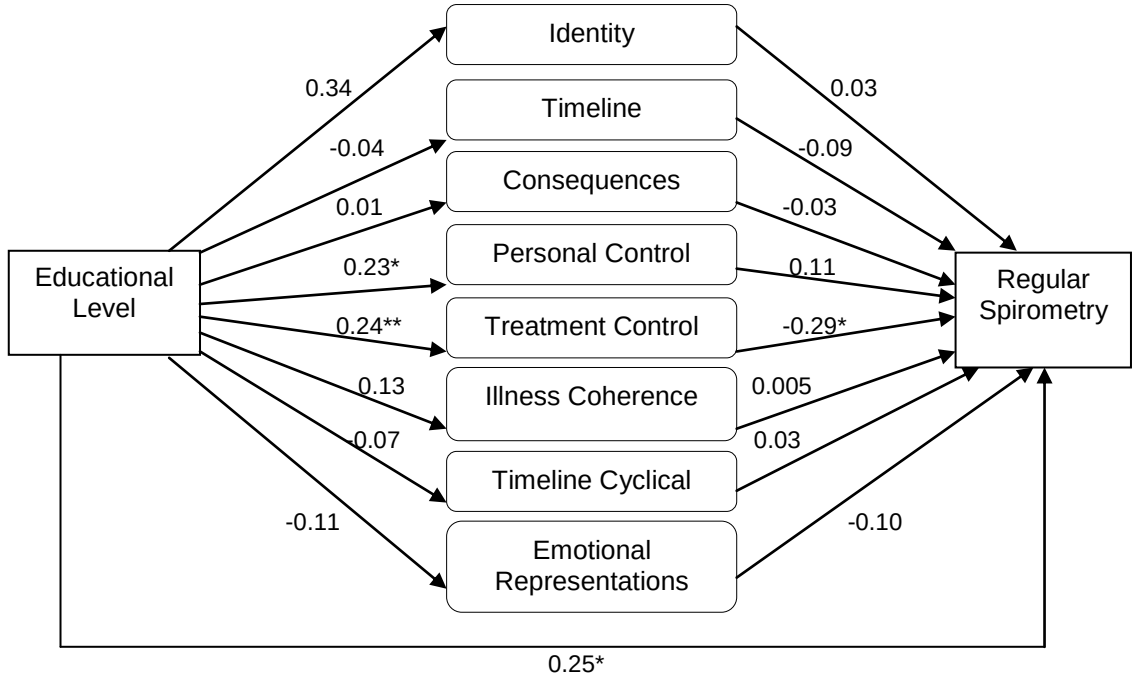
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12d Direct, total and specific indirect effects of educational level and illness perceptions on HCA (regular spirometry) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.25	3.14	0.002	0.0920	0.4041

Indirect effects	Point estimate	Lower	Upper
Total	-0.02	-0.0859	0.0454
Specific indirect effects			
Identity	0.01	-0.0110	0.0492
Timeline	0.003	-0.0206	0.0313
Consequences	-0.0003	-0.0187	0.0202
Personal Control	0.03	-0.0033	0.0709
Treatment Control	-0.07	-0.1361	-0.0210
Illness Coherence	0.0006	-0.0160	0.0227
Timeline Cyclical	-0.002	-0.0243	0.0129
Emotional Representations	0.01	-0.0106	0.0495

Figure F12d Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by illness perceptions in COPD



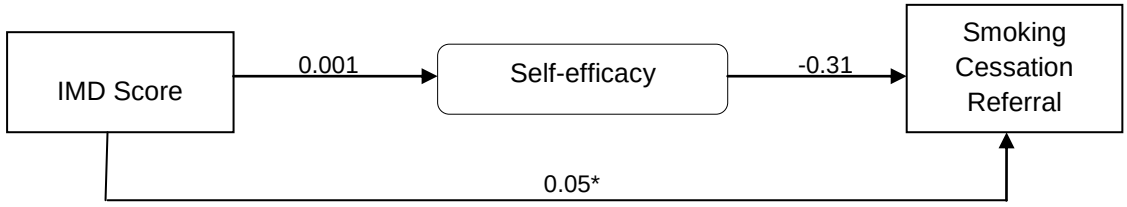
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12e Direct, total and specific indirect effects of IMD scores and self-efficacy on HCA (smoking cessation referrals) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.05	2.77	0.006	0.0134	0.0781

Indirect effects	Point estimate	Lower	Upper
Specific indirect effect			
Self-efficacy	-0.0004	-0.0084	0.0021

Figure F12e Multiple mediation analysis examining the relationship between IMD scores and HCA (smoking cessation referrals) mediated by self-efficacy in COPD

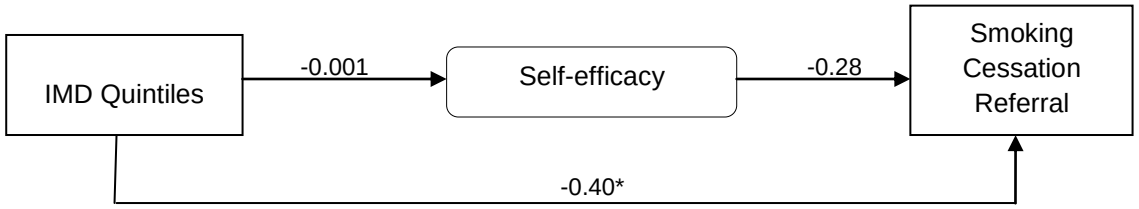


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12f Direct, total and specific indirect effects of IMD quintiles and self-efficacy on HCA (smoking cessation referrals) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.40	-1.96	0.05	-0.8030	-0.0008
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.0004			-0.0492	0.0687

Figure F12f Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by self-efficacy

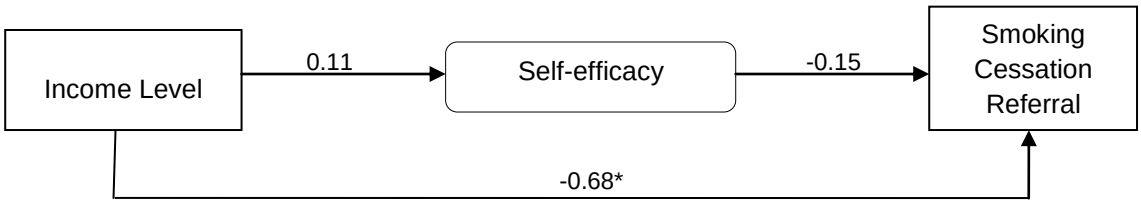


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12g Direct, total and specific indirect effects of income level and self-efficacy on HCA (smoking cessation referrals) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.68	-2.84	0.005	-1.1438	-0.2095
Indirect effects	**Point estimate**			**Lower**	**Upper**
Specific indirect effect					
Self-efficacy	-0.02			-0.1445	0.0382

Figure F12g Multiple mediation analysis examining the relationship between income level and HCA (smoking cessation referrals) mediated by self-efficacy in COPD

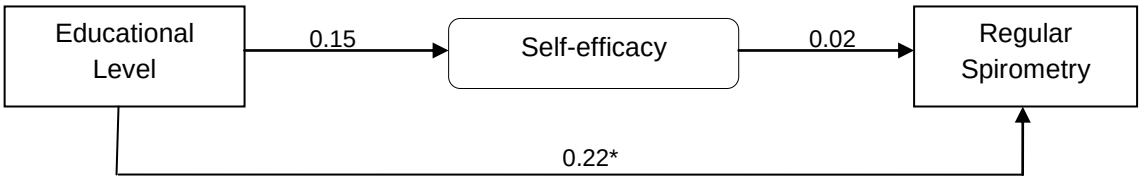


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12h Direct, total and specific indirect effects of educational level and self-efficacy on HCA (regular spirometry) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.22	2.93	0.004	0.0730	0.3747
Indirect effects	**Point estimate**			**Lower**	**Upper**
Specific indirect effect					
Self-efficacy	0.004			-0.0112	0.0367

Figure F12h Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by self-efficacy in COPD



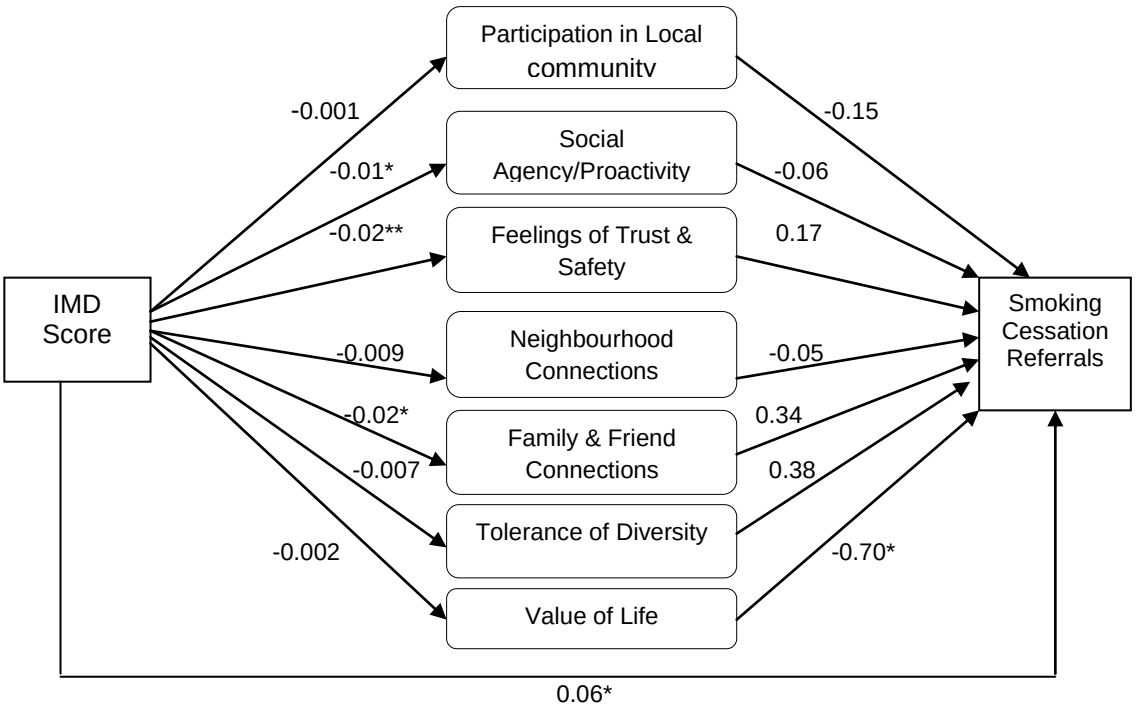
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12i Direct, total and specific indirect effects of IMD scores and social capital on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	0.06	3.06	0.002	0.0209	0.0958

Indirect effects	Point estimate	Lower	Upper
Total	-0.009	-0.0294	0.0096
Specific indirect effects			
Participation in local community	0.0002	-0.0018	0.0058
Social Agency/Proactivity	0.0007	-0.0096	0.0113
Feelings of trust & safety	-0.003	-0.0184	0.0091
Neighbourhood connections	0.0005	-0.0049	0.0098
Family & friends connections	-0.005	-0.0218	0.0047
Tolerance of diversity	-0.003	-0.0144	0.0015
Value of life	0.001	-0.0089	0.0131

Figure F12i Multiple mediation analysis examining the relationship between IMD score and HCA (smoking cessation referrals) mediated by social capital in COPD



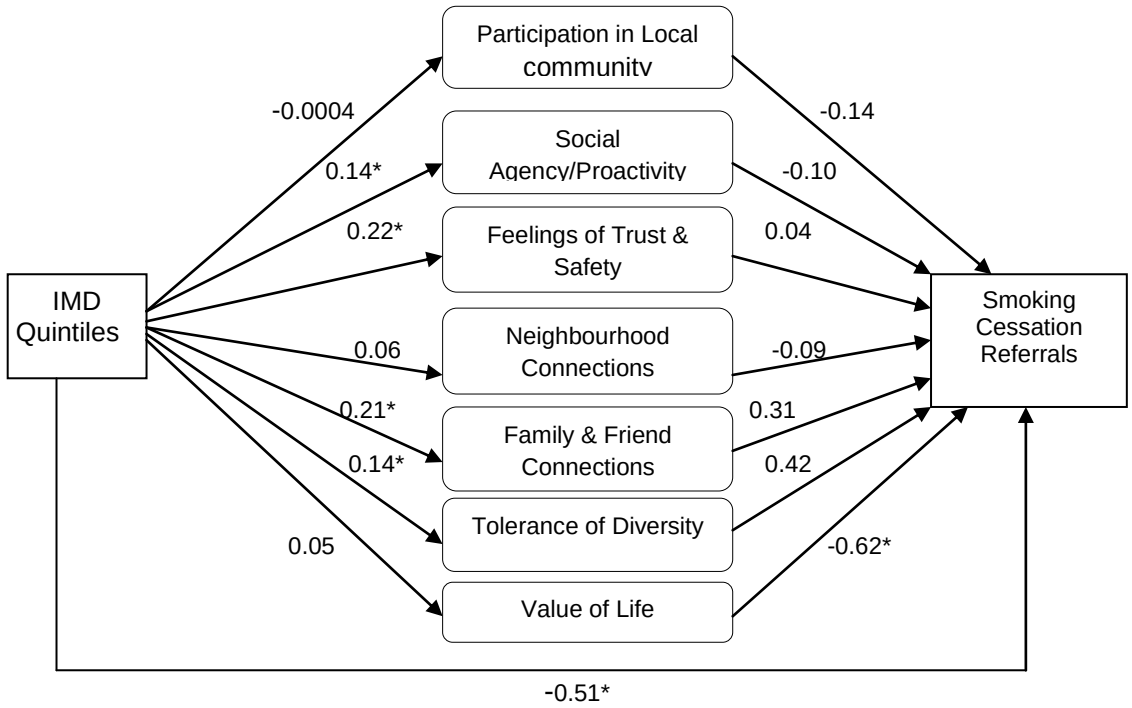
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12j Direct, total and specific indirect effects of IMD quintiles and social capital on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.51	-2.23	0.03	-0.9620	-0.0612

Indirect effects	Point estimate	Lower	Upper
Total	0.09	-0.1339	0.3345
Specific indirect effects			
Participation in local community	0.0001	-0.0562	0.0517
Social Agency/Proactivity	-0.01	-0.1647	0.1050
Feelings of trust & safety	0.009	-0.1383	0.1611
Neighbourhood connections	-0.006	-0.1179	0.0347
Family & friends connections	0.06	-0.0737	0.2766
Tolerance of diversity	0.06	-0.0151	0.2411
Value of life	-0.03	-0.1880	0.0662

Figure F12j Multiple mediation analysis examining the relationship between IMD quintiles and HCA (smoking cessation referrals) mediated by social capital in COPD



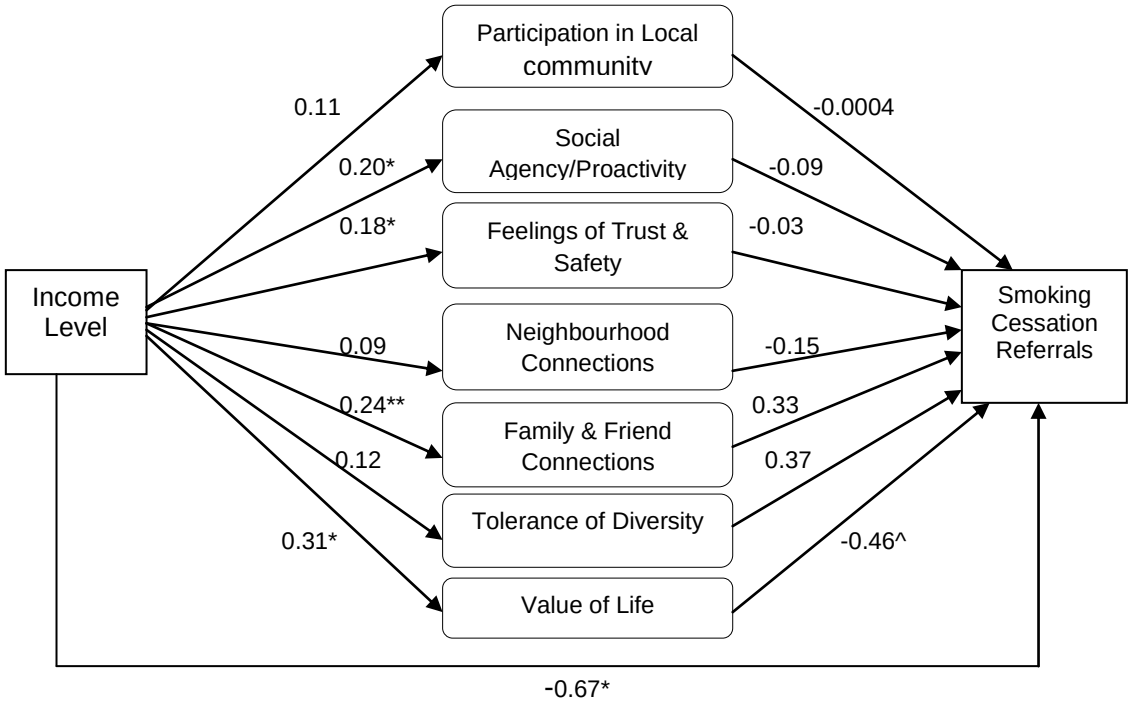
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12k Direct, total and specific indirect effects of income level and social capital on HCA (smoking cessation referral) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.67	-2.59	0.01	-1.1793	-0.1622

Indirect effects	Point estimate	Lower	Upper
Total	-0.06	-0.3491	0.2446
Specific indirect effects			
Participation in local community	0.000	-0.0980	0.0824
Social Agency/Proactivity	-0.02	-0.2257	0.1711
Feelings of trust & safety	-0.006	-0.1557	0.1158
Neighbourhood connections	-0.01	-0.1782	0.0330
Family & friends connections	0.08	-0.0879	0.3089
Tolerance of diversity	0.04	-0.0188	0.1829
Value of life	-0.14	-0.4143	-0.0017

Figure F12k Multiple mediation analysis examining the relationship between income level and HCA (smoking cessation referrals) mediated by social capital in COPD



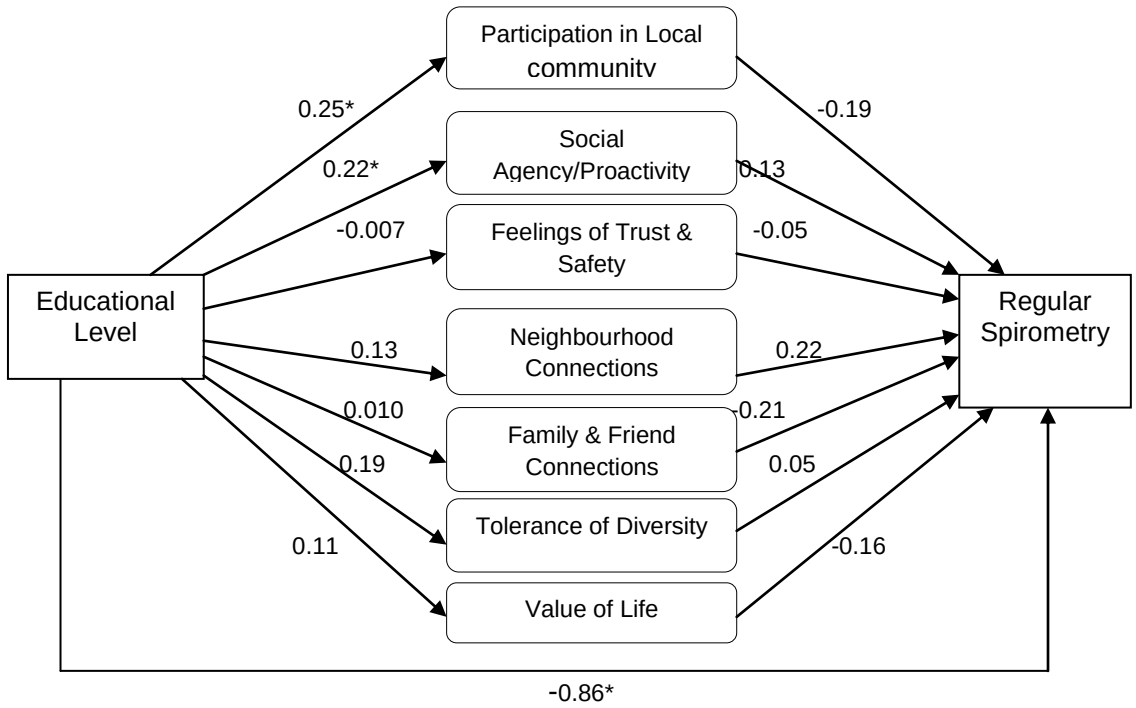
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F12l Direct, total and specific indirect effects of educational level and social capital on HCA (regular spirometry) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	z	p	Lower	Upper
	-0.86	-2.63	0.009	-1.5089	-0.2199

Indirect effects	Point estimate	Lower	Upper
Total	-0.003	-0.2652	0.2852
Specific indirect effects			
Participation in local community	-0.05	-0.2769	0.0702
Social Agency/Proactivity	0.03	-0.1132	0.2597
Feelings of trust & safety	0.0003	-0.0629	0.0690
Neighbourhood connections	0.03	-0.0295	0.2169
Family & friends connections	-0.002	-0.1161	0.0594
Tolerance of diversity	0.009	-0.0846	0.1562
Value of life	-0.02	-0.1724	0.0288

Figure F12l Multiple mediation analysis examining the relationship between educational level and HCA (regular spirometry) mediated by social capital in COPD



** significant at 0.05; **significant at 0.001; ^ marginally not significant*

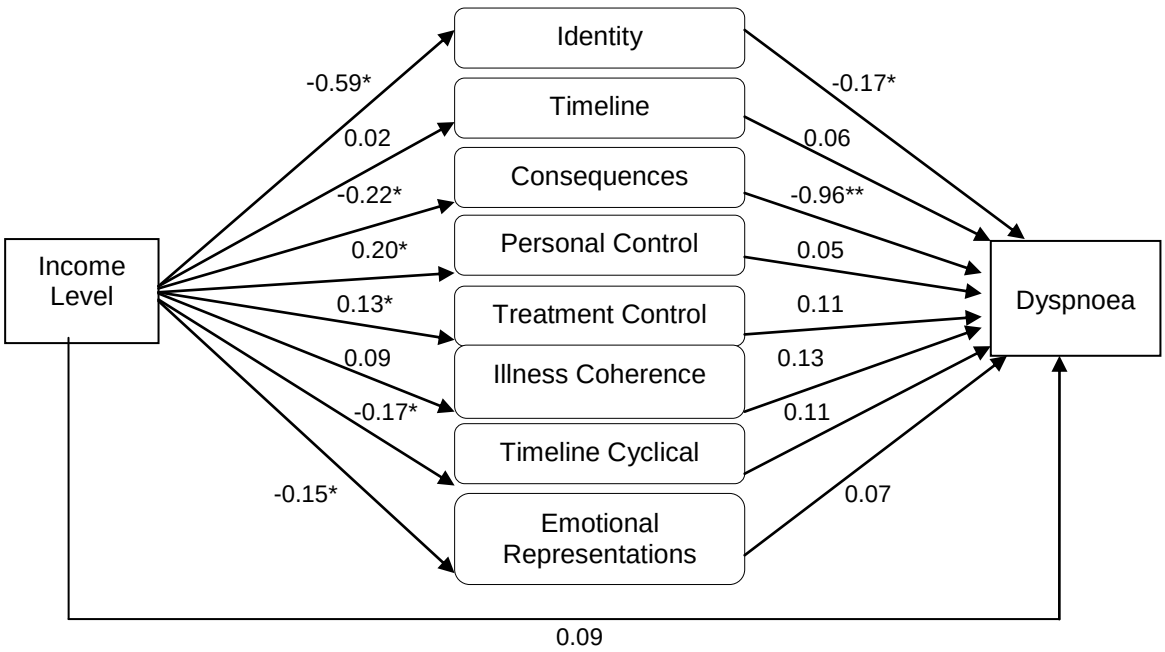
Appendix F13: Unadjusted mediation analyses examining illness perceptions, as mediators in the relationship between SES and QoL

Table F13a Direct, total and specific indirect effects of income level and illness perceptions on QoL (dyspnoea) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.09,	0.86	0.39	-0.1173	0.3002

Indirect effects	Point estimate	Lower	Upper
Total	0.32	0.1470	0.5039
Specific indirect effects			
Identity	0.10	0.0245	0.2304
Timeline	0.001	-0.0151	0.0388
Consequences	0.22	0.0885	0.3968
Personal Control	0.01	-0.0465	0.0711
Treatment Control	0.01	-0.0344	0.0849
Illness Coherence	0.01	-0.0064	0.0626
Timeline Cyclical	-0.02	-0.0763	0.0107
Emotional Representations	-0.01	-0.0862	0.0269

Figure F13a Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by illness perceptions in COPD

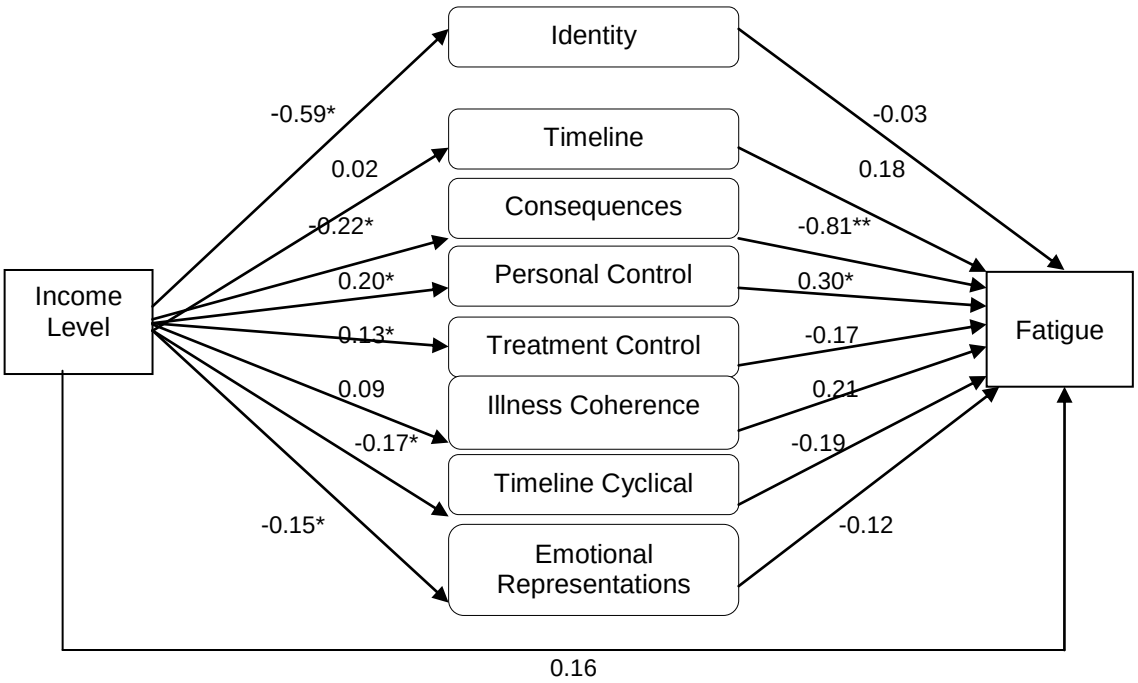


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F13b Direct, total and specific indirect effects of income level and illness perceptions on QoL (fatigue) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.16	1.21	0.23	-0.1031	0.4282
Indirect effects	Point estimate			Lower	Upper
Total	0.31			0.1580	0.4845
Specific indirect effects					
Identity	0.02			-0.0418	0.0988
Timeline	0.004			-0.0207	0.0588
Consequences	0.18			0.0665	0.3591
Personal Control	0.06			0.0074	0.1557
Treatment Control	-0.02			-0.1103	0.0322
Illness Coherence	0.02			-0.0057	0.0823
Timeline Cyclical	0.03			-0.0063	0.1163
Emotional Representations	0.02			-0.0234	0.1005

Figure F13b Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by illness perceptions in COPD

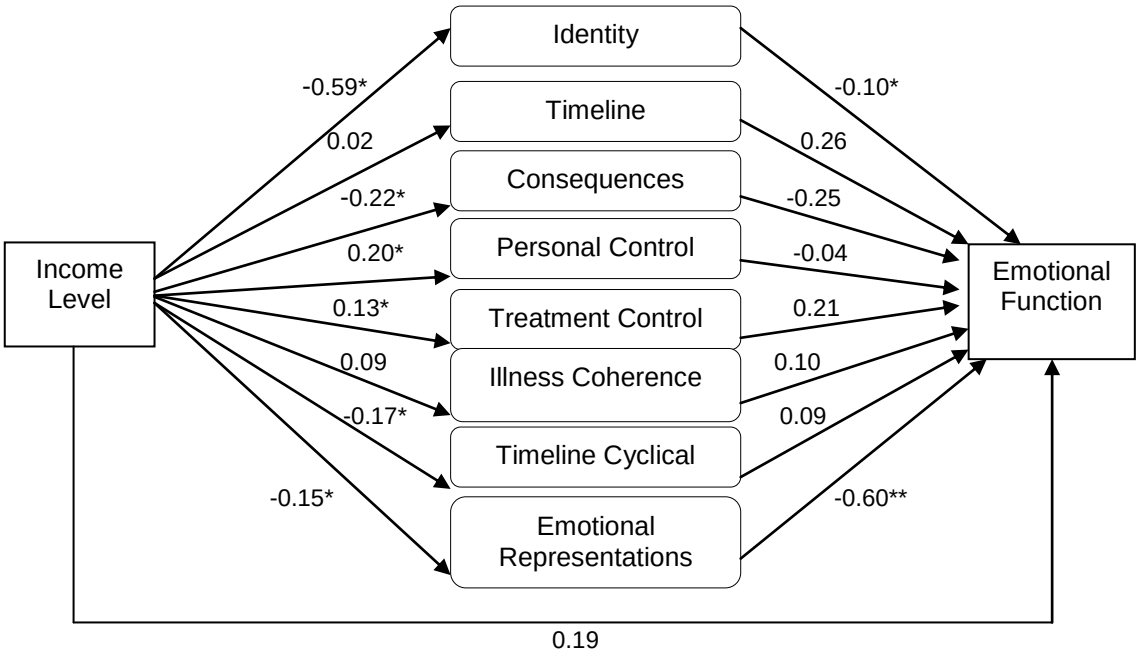


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F13c Direct, total and specific indirect effects of income level and illness perceptions on QoL (emotional function) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.19	1.62	0.11	-0.0415	0.4272
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.22			0.0857	0.3946
Specific indirect effects					
Identity	0.06			0.0026	0.1563
Timeline	0.006			-0.0278	0.0766
Consequences	0.06			-0.0125	0.1809
Personal Control	-0.009			-0.0751	0.0480
Treatment Control	0.03			-0.0213	0.1145
Illness Coherence	0.01			-0.0094	0.0647
Timeline Cyclical	-0.02			-0.0816	0.0226
Emotional Representations	0.09			0.0142	0.2126

Figure F13c Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by illness perceptions in COPD

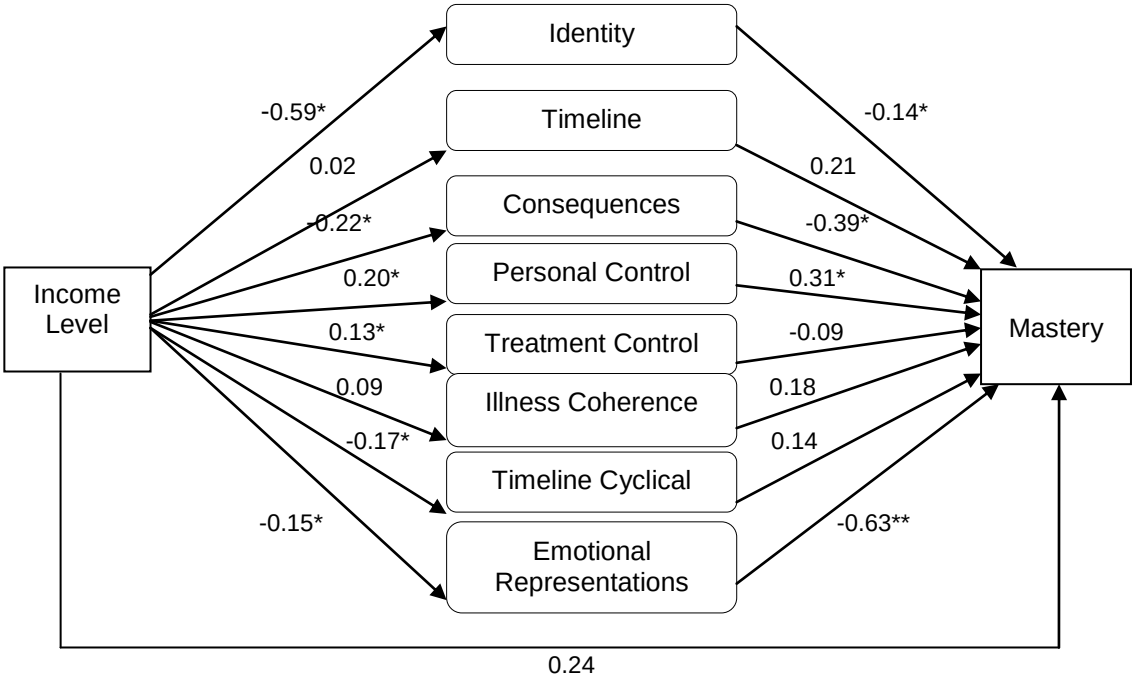


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F13d Direct, total and specific indirect effects of income level and illness perceptions on QoL (mastery) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.24	1.97	0.05	-0.0003	0.4878
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.31			0.1455	0.5143
Specific indirect effects					
Identity	0.08			0.0162	0.1947
Timeline	0.005			-0.0231	0.0704
Consequences	0.09			0.0112	0.2204
Personal Control	0.06			0.0088	0.1647
Treatment Control	-0.01			-0.0874	0.0431
Illness Coherence	0.02			-0.0046	0.0767
Timeline Cyclical	-0.02			-0.1013	0.0144
Emotional Representations	0.10			0.0129	0.2375

Figure F13d Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by illness perceptions in COPD

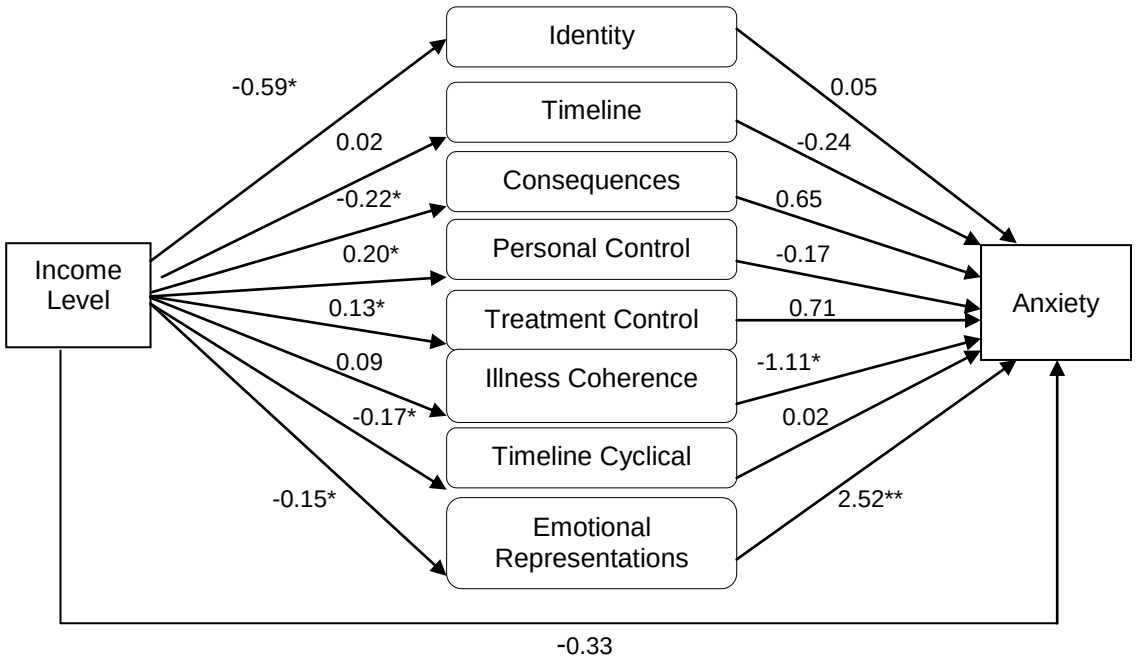


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F13e Direct, total and specific indirect effects of income level and illness perceptions on QoL (anxiety) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.33	-0.81	0.42	-1.1456	0.4797
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.62			-1.1749	-0.0875
Specific indirect effects					
Identity	-0.03			-0.2738	0.1670
Timeline	-0.005			-0.1787	0.0664
Consequences	-0.14			-0.5049	0.0820
Personal Control	-0.03			-0.2937	0.1357
Treatment Control	0.09			-0.0684	0.3632
Illness Coherence	-0.10			-0.3495	0.0111
Timeline Cyclical	-0.003			-0.1829	0.1539
Emotional Representations	-0.39			-0.8741	-0.0453

Figure F13e Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by illness perceptions in COPD



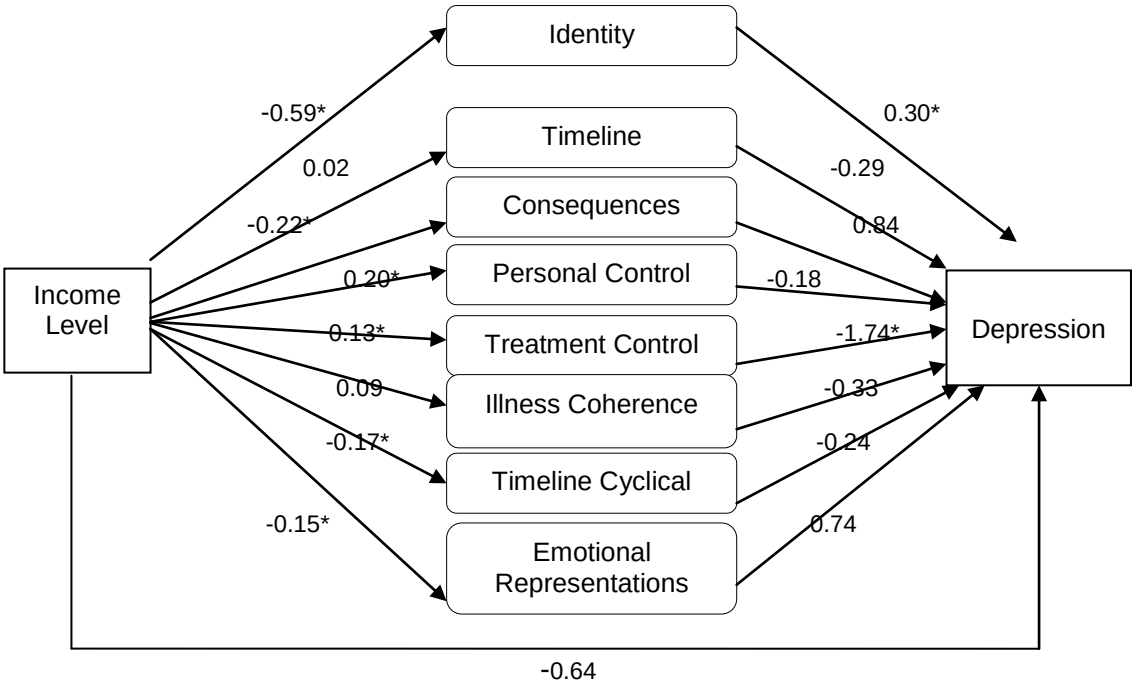
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F13f Direct, total and indirect effects of income level and illness perceptions on QoL (depression) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.64	-1.70	0.09	-1.3765	0.1040

Indirect effects	Point estimate	Lower	Upper
Total	-0.75	-1.2755	-0.3186
Specific indirect effects			
Identity	-0.18	-0.5299	0.0053
Timeline	-0.006	-0.1718	0.0488
Consequences	-0.19	-0.5219	0.0229
Personal Control	-0.04	-0.2690	0.1475
Treatment Control	-0.23	-0.6530	-0.0107
Illness Coherence	-0.03	-0.2230	0.0476
Timeline Cyclical	0.04	-0.0791	0.2525
Emotional Representations	-0.11	-0.4005	0.0053

Figure F13f Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by illness perceptions in COPD



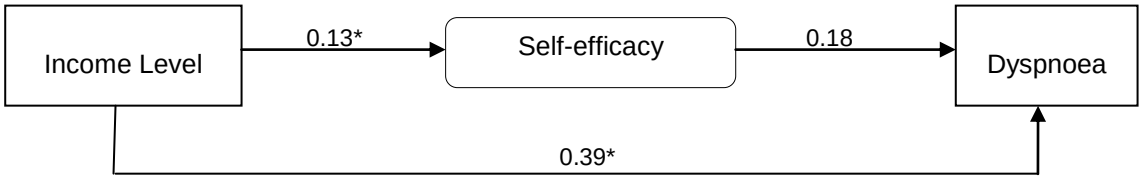
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Appendix F14: Unadjusted mediation analyses examining self-efficacy as a mediator in the relationship between SES and QoL

Table F14a Direct, total and specific indirect effects of income level and self-efficacy on QoL (dyspnoea) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.39	2.93	0.004	0.1280	0.6551
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.02			-0.0091	0.0944

Figure F14a Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by self-efficacy in COPD

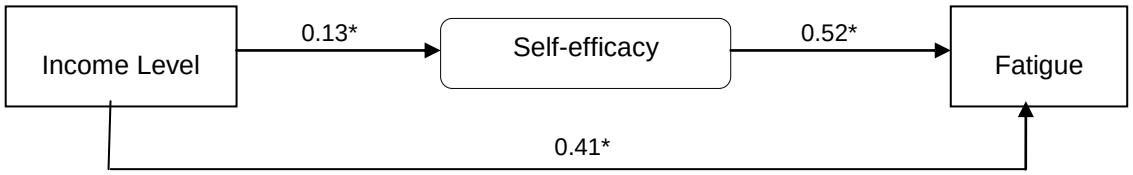


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Figure F14b Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by self-efficacy in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.41	2.85	0.005	0.1268	0.6950
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.07			0.0080	0.0880

Table F14b Direct, total and specific indirect effects of income level and self-efficacy on QoL (fatigue) in COPD

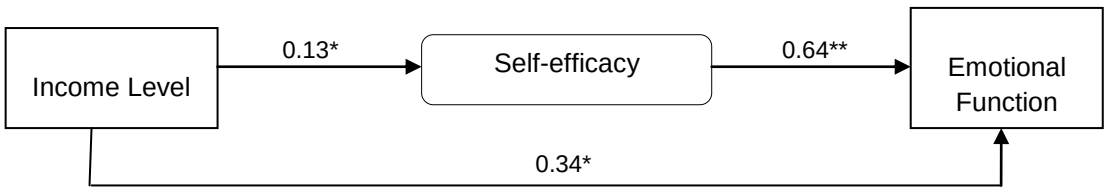


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F14c Direct, total and specific indirect effects of income level and self-efficacy on QoL (emotional function) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.34	2.72	0.007	0.0921	0.5808
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.09			0.0096	0.2161

Figure F14c Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by self-efficacy in COPD

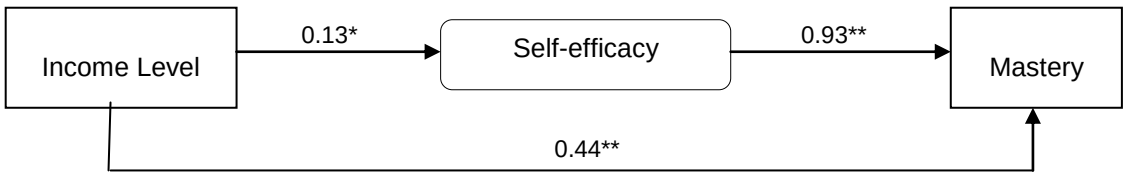


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F14d Direct, total and specific indirect effects of income level and self-efficacy on QoL (mastery) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.44	3.29	0.001	0.1761	0.7049
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	0.12			0.0134	0.2761

Figure F14d Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by self-efficacy in COPD

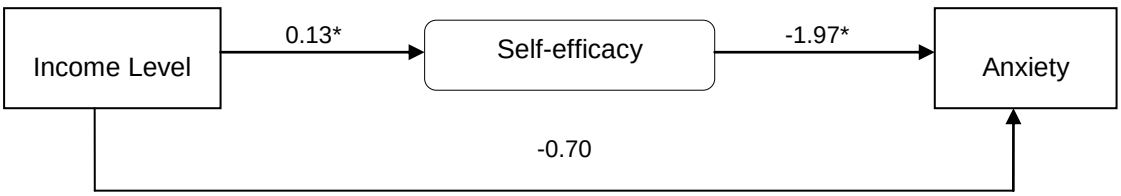


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F14e Direct, total and specific indirect effects of income level and self-efficacy on QoL (anxiety) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.70	-1.55	0.12	-1.5956	0.1917
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	-0.25			-0.6456	-0.0273

Figure F14e Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by self-efficacy in COPD

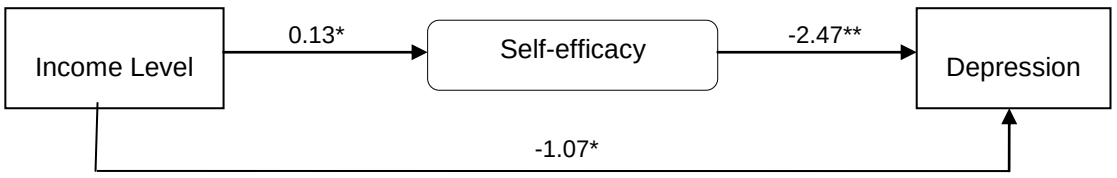


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F14f Direct, total and specific indirect effects of income level and self-efficacy on QoL (depression) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	1.07	-2.94	0.004	-1.7871	-0.3515
Indirect effects	Point estimate			Lower	Upper
Specific indirect effect					
Self-efficacy	-0.31			-0.7278	-0.0362

Figure F14f Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by self-efficacy in COPD



** significant at 0.05; **significant at 0.001; ^ marginally not significant*

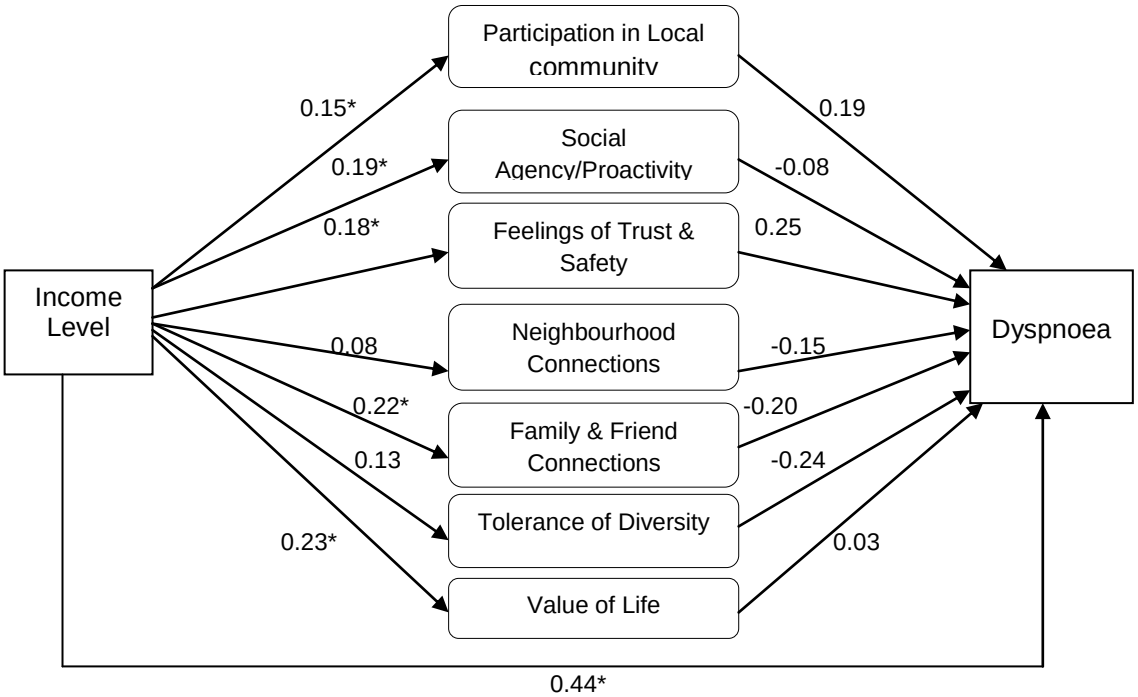
Appendix F15: Unadjusted mediation analyses examining social capital as a mediator in the relationship between SES and QoL

Table F15a Direct, total and specific indirect effects of income level and social capital on QoL (dyspnoea) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.44	3.11	0.002	0.1589	0.7112

Indirect effects	Point estimate	Lower	Upper
Total	-0.02	-0.1532	0.1076
Specific indirect effects			
Participation in local community	0.03	-0.0045	0.1061
Social Agency/Proactivity	-0.02	-0.1186	0.0605
Feelings of trust & safety	0.05	-0.0012	0.1460
Neighbourhood connections	-0.01	-0.0849	0.0111
Family & friends connections	-0.04	-0.1410	0.0204
Tolerance of diversity	-0.03	-0.1034	0.0024
Value of life	0.007	-0.0540	0.0794

Figure F15a Multiple mediation analysis examining the relationship between income level and QoL (dyspnoea) mediated by social capital in COPD



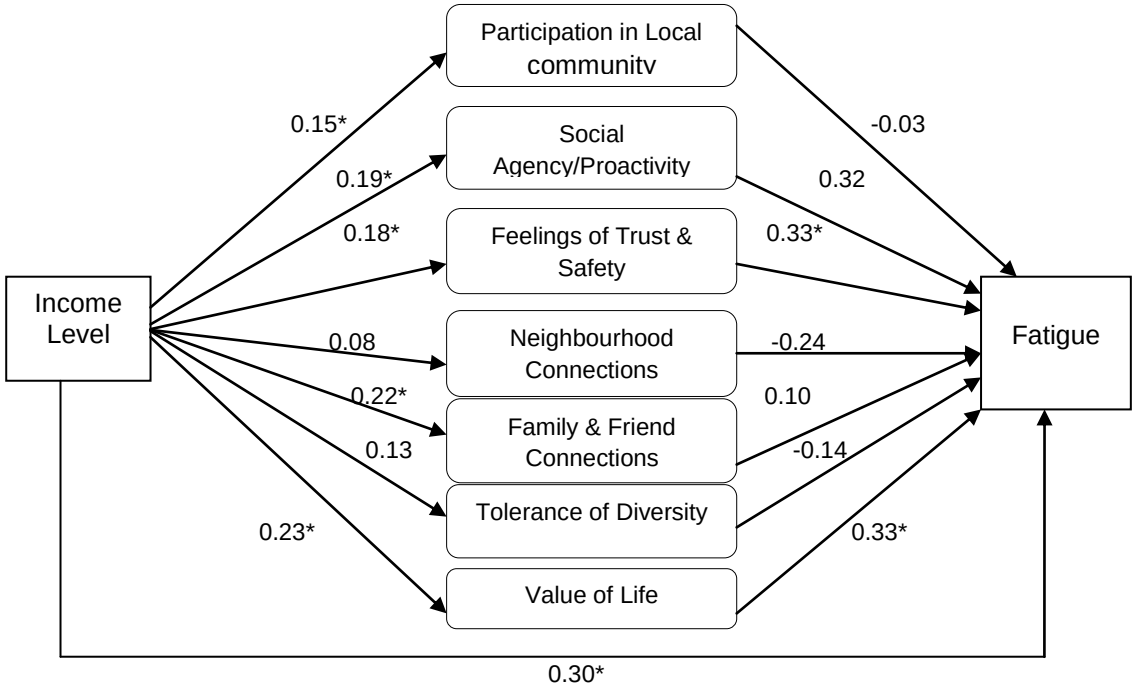
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F15b Direct, total and specific indirect effects of income level and social capital on QoL (fatigue) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.30	2.00	0.05	0.0043	0.5972

Indirect effects	Point estimate	Lower	Upper
Total	0.18	0.0275	0.3517
Specific indirect effects			
Participation in local community	-0.005	-0.0888	0.0465
Social Agency/Proactivity	0.06	-0.0156	0.1777
Feelings of trust & safety	0.06	0.0046	0.1768
Neighbourhood connections	-0.02	-0.0990	0.0092
Family & friends connections	0.02	-0.0567	0.1174
Tolerance of diversity	-0.02	-0.0856	0.0113
Value of life	0.07	0.0088	0.2000

Figure F15b Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by social capital in COPD



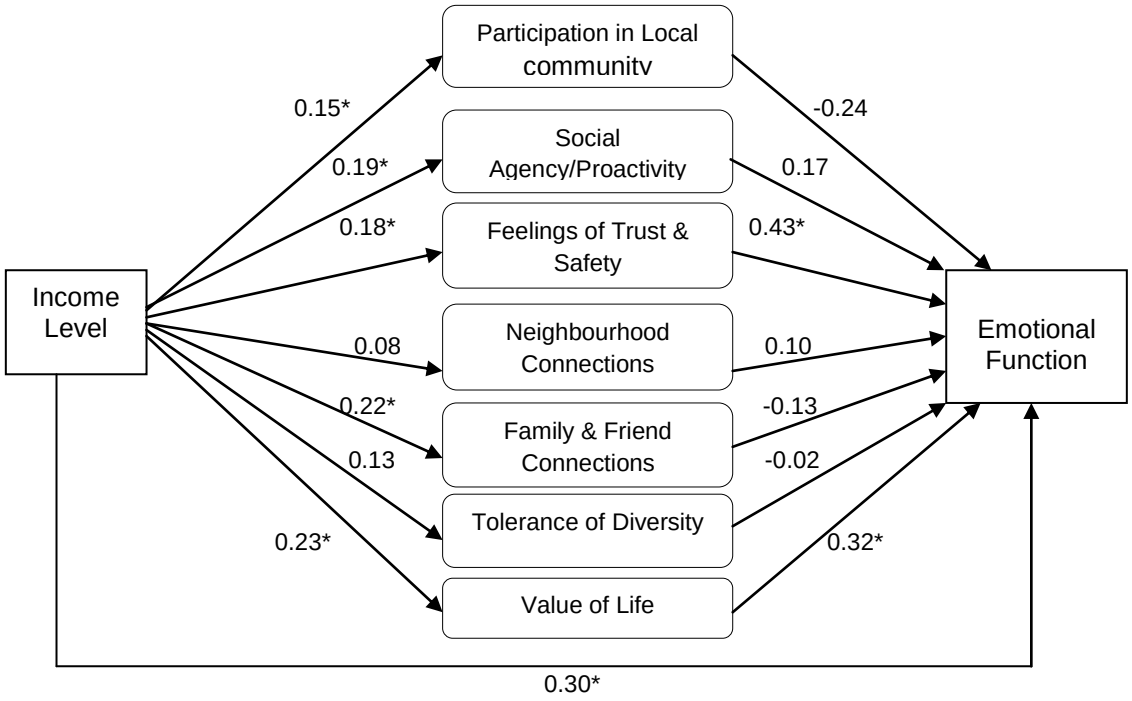
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F15c Direct, total and specific indirect effects of income level and social capital on QoL (emotional function) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.30	2.31	0.02	0.0430	0.5471

Indirect effects	Point estimate	Lower	Upper
Total	0.12	-0.0209	0.2947
Specific indirect effects			
Participation in local community	-0.03	-0.1293	0.0047
Social Agency/Proactivity	0.03	-0.0269	0.1227
Feelings of trust & safety	0.08	0.0173	0.1869
Neighbourhood connections	0.008	-0.0127	0.0705
Family & friends connections	-0.03	-0.1233	0.0368
Tolerance of diversity	-0.003	-0.0507	0.0298
Value of life	0.07	0.0106	0.1851

Figure F15c Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by social capital in COPD



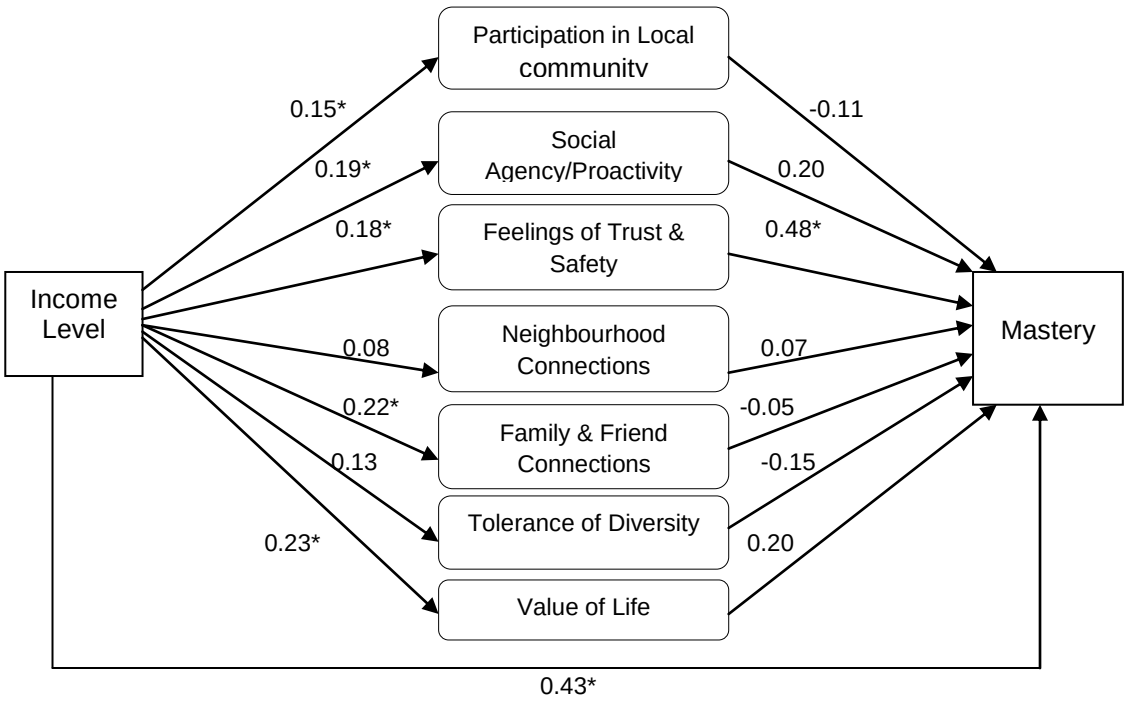
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F15d Direct, total and specific indirect effects of income level and social capital on QoL (mastery) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.43	2.90	0.004	0.1363	0.7188

Indirect effects	Point estimate	Lower	Upper
Total	0.13	-0.0039	0.3138
Specific indirect effects			
Participation in local community	-0.02	-0.0861	0.0176
Social Agency/Proactivity	0.04	-0.0311	0.1467
Feelings of trust & safety	0.09	0.0199	0.2178
Neighbourhood connections	0.006	-0.0151	0.0724
Family & friends connections	-0.01	-0.0965	0.0656
Tolerance of diversity	-0.02	-0.0917	0.0114
Value of life	0.05	-0.0051	0.1488

Figure F15d Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by social capital in COPD



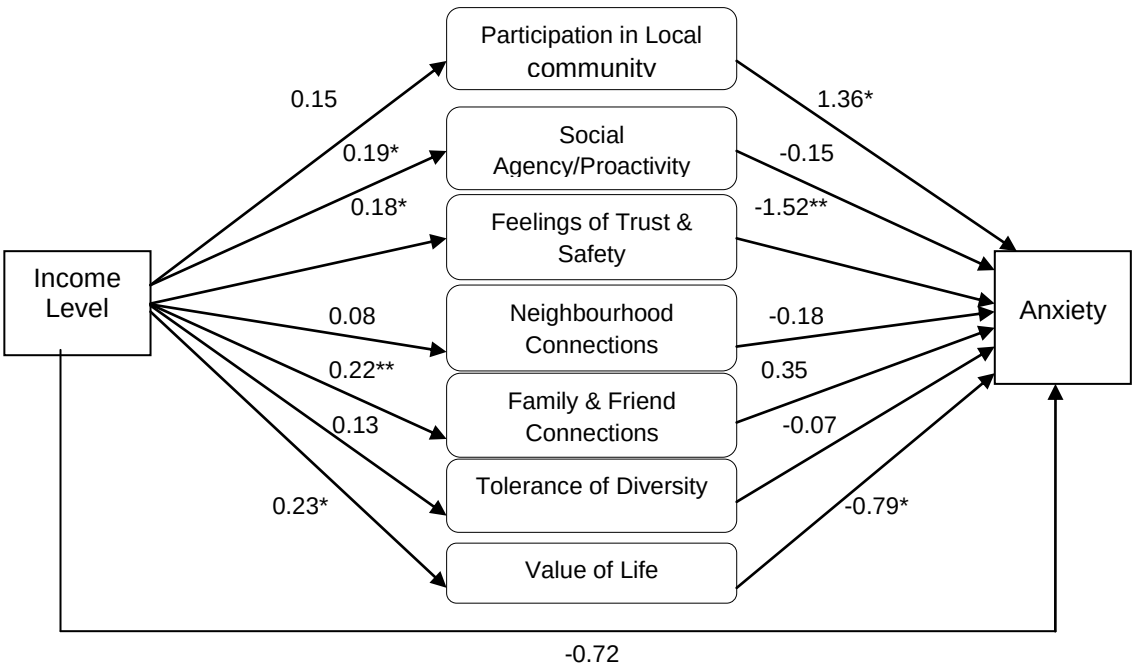
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F15e Direct, total and specific indirect effects of income level and social capital on QoL (anxiety) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.72	-1.60	0.11	-1.6023	0.1661

Indirect effects	Point estimate	Lower	Upper
Total	-0.23	-0.7823	0.2660
Specific indirect effects			
Participation in local community	0.20	-0.0017	0.5697
Social Agency/Proactivity	-0.03	-0.2963	0.1901
Feelings of trust & safety	-0.28	-0.6579	-0.0640
Neighbourhood connections	-0.01	-0.2093	0.0665
Family & friends connections	0.08	-0.1474	0.3854
Tolerance of diversity	-0.009	-0.1898	0.1009
Value of life	-0.18	-0.5182	-0.0118

Figure F15e Multiple mediation analysis examining the relationship between income level and QoL (anxiety) mediated by social capital in COPD

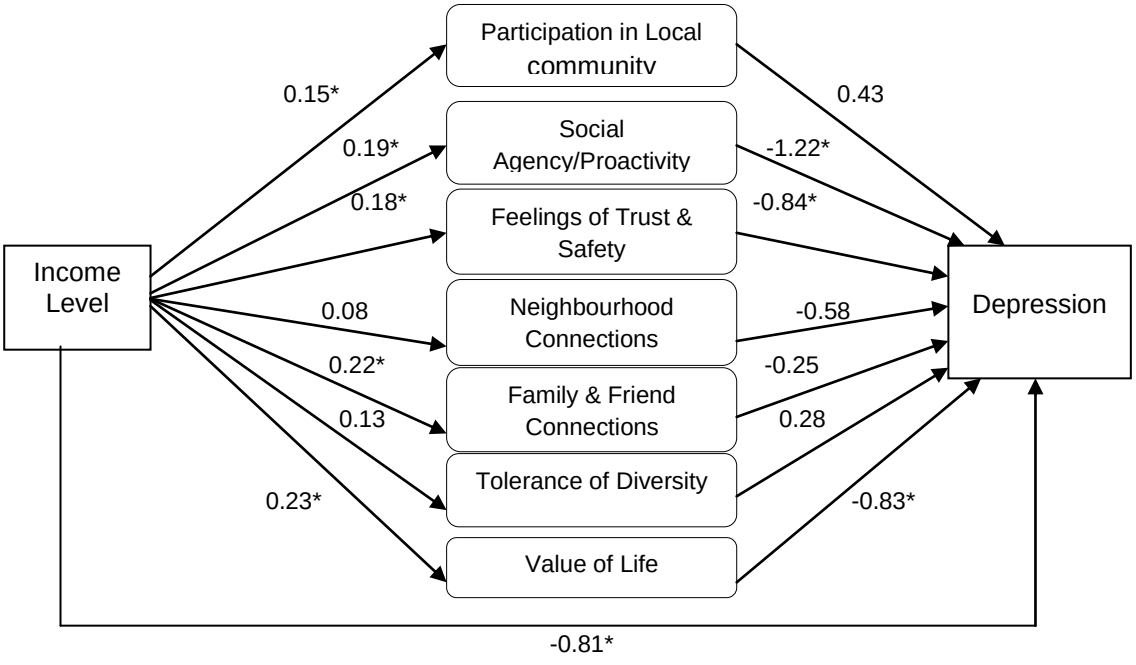


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F15f Direct, total and specific indirect effects of income level and social capital on QoL (depression) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.81	-2.14	0.03	-1.5577	-0.0612
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	-0.57			-1.1181	-0.1402
Specific indirect effects					
Participation in local community	0.06			-0.0178	0.3069
Social Agency/Proactivity	-0.23			-0.5110	-0.0510
Feelings of trust & safety	-0.15			-0.4330	-0.0181
Neighbourhood connections	-0.05			-0.3005	0.0227
Family & friends connections	-0.06			-0.3264	0.1716
Tolerance of diversity	0.04			-0.0462	0.2078
Value of life	-0.19			-0.5020	-0.0272

Figure F15f Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by social capital in COPD



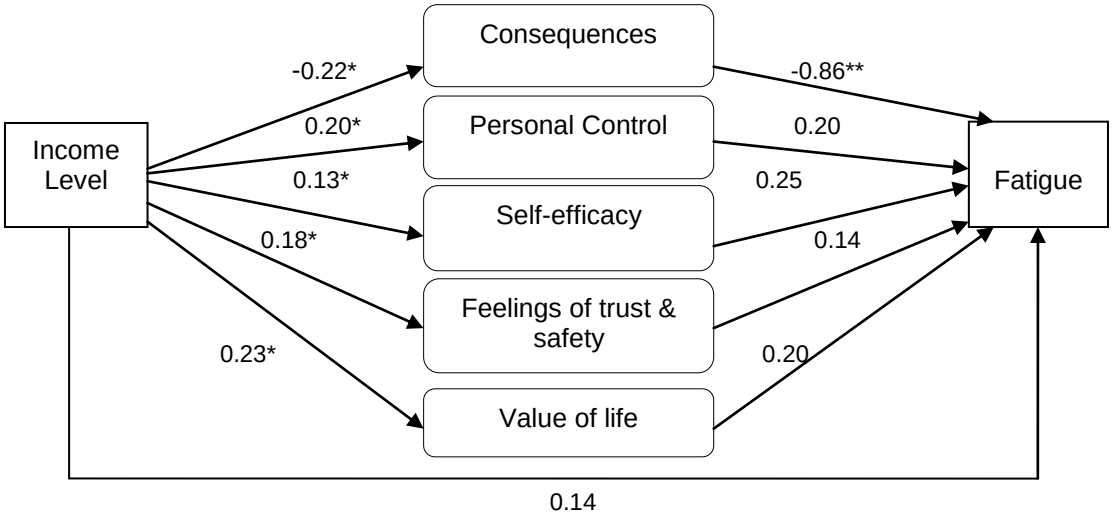
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Appendix F16: Unadjusted mediation analyses examining illness perceptions, self-efficacy and social capital as mediators in the relationship between SES and QoL

Table F16a Direct, total and specific indirect effects of income level and illness perceptions, self-efficacy and social capital on QoL (fatigue) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.14	1.05	0.30	-0.1238	0.4054
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.34			0.1749	0.5281
Specific indirect effects					
Consequences	0.19			0.0760	0.3388
Personal Control	0.04			-0.0046	0.1175
Self-efficacy	0.03			-0.0047	0.1132
Feelings of trust and safety	0.03			-0.0200	0.1055
Value of life	0.04			-0.0044	0.1403

Figure F16a Multiple mediation analysis examining the relationship between income level and QoL (fatigue) mediated by illness perceptions, self-efficacy and social capital in COPD



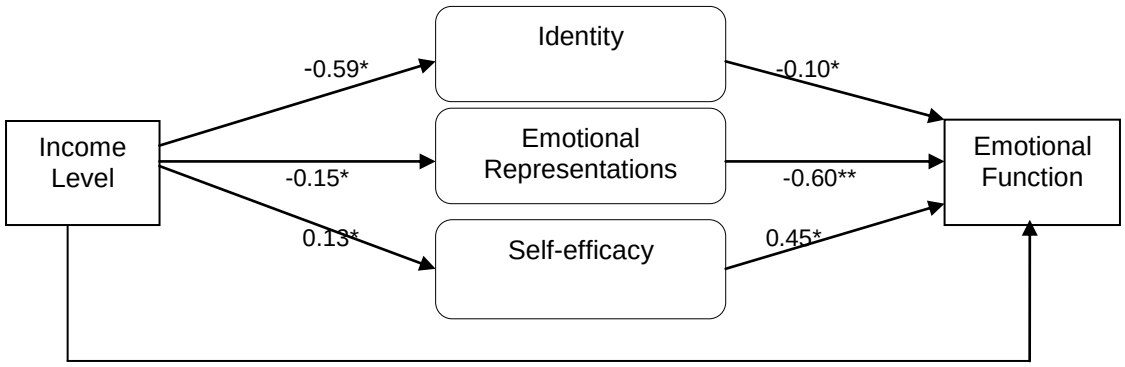
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F16b Direct, total and specific indirect effects of income level, illness perceptions and self-efficacy on QoL (emotional function) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.21	1.86	0.06	-0.0124	0.4290

Indirect effects	Point estimate	Lower	Upper
Total	0.21	0.0764	0.3563
Specific indirect effects			
Identity	0.06	0.0147	0.2030
Emotional representations	0.09	0.0045	0.1634
Self-efficacy	0.06	0.0130	0.1409

Figure F16b Multiple mediation analysis examining the relationship between income level and QoL (emotional function) mediated by illness perceptions and self-efficacy in COPD

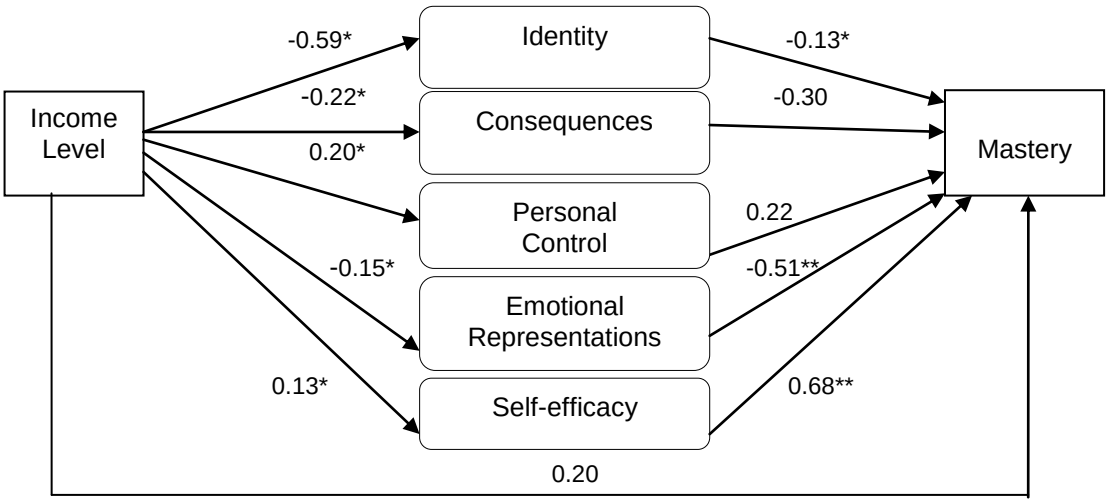


** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F16c Direct, total and specific indirect effects of income level, illness perceptions and self-efficacy on QoL (mastery) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	0.20	1.76	0.08	-0.0245	0.4323
Indirect effects	**Point estimate**			**Lower**	**Upper**
Total	0.35			0.1672	0.5647
Specific indirect effects					
Identity	0.08			0.0193	0.1884
Consequences	0.07			0.0048	0.1760
Personal Control	0.05			-0.0003	0.1256
Emotional representations	0.08			0.0112	0.2039
Self-efficacy	0.09			0.0146	0.2077

Figure F16c Multiple mediation analysis examining the relationship between income level and QoL (mastery) mediated by illness perceptions and self-efficacy in COPD



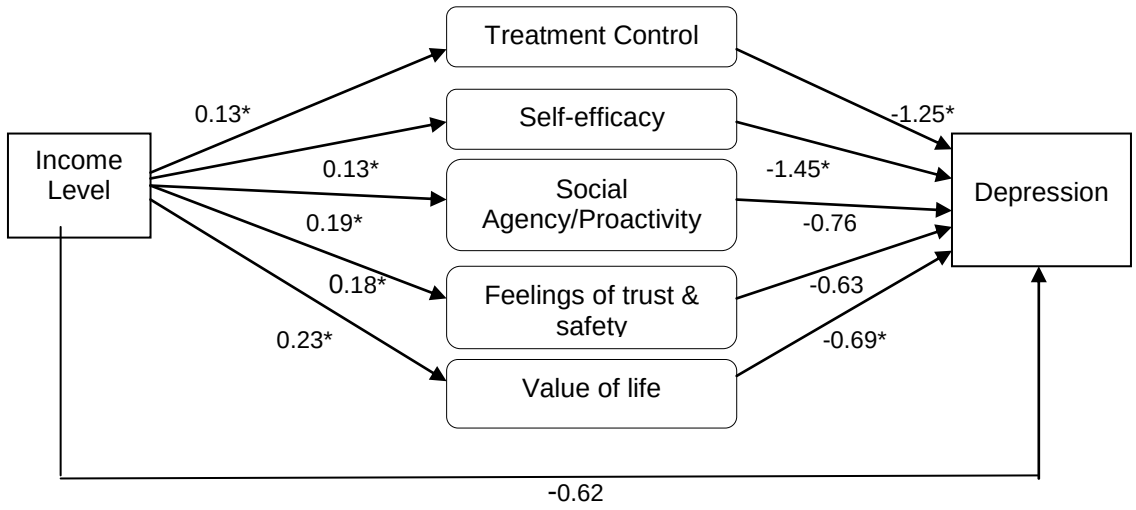
** significant at 0.05; **significant at 0.001; ^ marginally not significant*

Table F16d Direct, total and specific indirect effects of income level, illness perceptions, self-efficacy and social capital on QoL (depression) in COPD

				95% bias-corrected and accelerated CI	
Direct effect	Point estimate	t	p	Lower	Upper
	-0.62	-1.72	0.09	-1.3299	0.0912

Indirect effects	Point estimate	Lower	Upper
Total	-0.76	-1.3166	-0.3222
Specific indirect effects			
Treatment Control	-0.17	-0.4201	-0.0239
Self-efficacy	-0.18	-0.5185	-0.0201
Social Agency/social proactivity	-0.14	-0.3670	-0.0017
Feelings of trust and safety	-0.12	-0.3900	-0.0005
Value of life	-0.16	-0.4291	-0.0179

Figure F16d Multiple mediation analysis examining the relationship between income level and QoL (depression) mediated by illness perceptions, self-efficacy and social capital in COPD



** significant at 0.05; **significant at 0.001; ^ marginally not significant*

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